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The association between Open Dialogue to young Danes in acute psychiatric crisis and their use of health care and social services

A retrospective register-based cohort study

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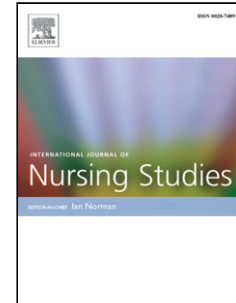
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The association between Open Dialogue to young Danes in acute psychiatric crisis and their use of health care and social services: A retrospective register-based cohort study

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Abstract:

Background: Although most mental disorders have their onset in early life, the mental health needs of young people are often not addressed adequately. Open Dialogue is a need-adapted approach that mobilizes psychosocial resources in a crisis struck person's social network. Open Dialogue is

organised as a series of network meetings and seeks to promote collaborative integrated care, and a non-directive psychotherapeutic stance. Its effectiveness for young people has not previously been assessed.

Objectives: The aim of the study was to examine whether a Danish Open Dialogue approach directed at young people, who sought help from Child and Adolescent Mental Health Services, reduced their utilisation of psychiatric and other health services, compared to peers receiving usual psychiatric treatment.

Design: A retrospective register-based cohort study.

Methods: Using clinical and national register data, a cohort of patients aged 14-19 years (n = 503) enrolled from one region during 2000 to 2015 were compared to a matched comparison group from two other regions using propensity scores. Utilisation of psychiatric health services, GP services, and social markers were assessed after 1, 2, 5 and 10 year of follow-up using logistic and Poisson regression models.

Results: Patients receiving Open Dialogue intervention had more psychiatric outpatient treatments at one year of follow-up (RR=1.2, CI: 1.1-1.4) than the comparison group, but not at subsequent follow-ups. Recipients of the intervention had fewer emergency psychiatric treatments (1 year follow-up: RR = 0.2, CI: 0.1-0.5; 10 years follow-up: RR = 0.5, CI: 0.3-0.8) and less use of general practitioner services (1 year follow-up: RR = 0.90, CI: 0.82-0.99; 10 years follow-up: RR = 0.85, CI: 0.78-0.92). There was no significant reduction in the number of psychiatric hospitalisation contacts or treatment days.

Conclusions: Open Dialogue was significantly associated with some reduced risks of utilising health care services. These mixed results should be tested in a randomized design.

What is already known about the topic:

- Open Dialogue is an innovative, need-adapted approach to mental health that mobilizes psychosocial resources in a crisis struck person's social network.
- Research on Open Dialogue is promising, but it is not yet possible to draw strong conclusions about the effects of the approach.

What this paper adds:

- This large-scale, long-term register linkage study from Southern Denmark is the first to examine associations between Open Dialogue and young people's utilisation of health services and social services
- Open Dialogue was significantly associated with some reduced risks of utilising health care services
- It is possible to successfully adapt and implement a sustainable Open Dialogue approach outside the sites in Finland where the approach was originally developed

MeSH:

- Delivery of Health Care, Integrated
- Mental Health Services
- Psychosocial Support Systems
- Psychotherapy
- Retrospective Studies.

Introduction

Most mental disorders usually have their onset in the first three decades of life (de Girolamo et al., 2012) and a strong relationship between poor mental health and other biopsychosocial problems has been emphasized in young people (Allen et al., 2014, Patel et al., 2007).

However, while the relationship between social factors and mental health is well-established, biopsychosocial interventions tend to focus on psychological and pharmacological mechanisms rather than extending social support and community intervention (Johnson, 2017), see for instance (Early Psychosis Guidelines Writing Group and EPPIC National Support Program, 2016, National Institute for Clinical Excellence (NICE), 2014). Reviews and meta-studies have shown promising results for school- and family-based interventions (Enns et al., 2016, Sandler et al., 2014) and family therapy (Carr, 2014, Claxton et al., 2017), however, the evidence has not been matched by policy changes and implementation of these integrated, affordable, and feasible interventions (Mendelson and Eaton, 2018, Patel et al., 2007). Moreover, the mental health needs of young people are often not met because of low service access and utility (de Girolamo et al., 2012). There is a need for evaluating upstream psychosocial interventions for young people with emerging mental health problems and their families (Patel et al., 2007).

While in conventional psychiatric practice, young people are usually seen by different professionals in separate sessions, Open Dialogue is a resource-oriented model of therapeutic intervention that promotes collaborative integrated care by means of network meetings between patient, family and social network members, and therapists, and a non-directive psychotherapeutic stance (Anderson and Gehart, 2006, Gordon et al., 2016, Priebe et al.,

2014, Rosen and Stoklosa, 2016). It was gradually developed in Finland during the 1980s to facilitate shared care service delivery in Western Lapland (Buus et al., 2017). Although the approach is not manualised, the following seven principles are prioritized: immediate help; a social network perspective; flexibility and mobility; responsibility; psychological continuity; tolerance of uncertainty; and dialogism (Seikkula et al., 2003). The approach might be linked to fewer days of hospitalisation, reduced psychotic symptoms, and improved social function and employment status for people experiencing a first-episode of psychosis (Aaltonen et al., 2011, Gromer, 2012, Seikkula et al., 2011, Seikkula et al., 2003). Recent publications describe 19-year follow-up analyses of some of the patients included in these studies (Bergström et al., 2017, Bergström et al., 2018). However, the body of evidence on Open Dialogue is limited to small-scale, descriptive studies of adult samples, using historical comparison groups, and not adjusting for important confounders (Buus et al., 2017, Gromer, 2012). It remains to be examined whether the approach would be associated with changes in utilisation of psychiatric health care services if offered to young people. A natural experiment is facilitated by the fact that an adapted version of Open Dialogue has been provided to young patients in a Danish region since the early 2000s.

Given that social support can mitigate mental illness in young people (Patel et al., 2007), we hypothesised that a responsive and network-integrating mental health care intervention would lower their utilisation of health and social services as well as limiting the level of social problems inflicted by presence of mental illness.

Aims of the study

The objective of this study was to examine whether a Danish Open Dialogue approach directed at young people who contacted Child and Adolescent Mental Health Services due to acute crisis reduced their utilisation of psychiatric and other health services, compared to peers receiving usual psychiatric treatment.

Methods

A cohort design was applied. Since 2000, the Department of Child and Adolescent Mental Health Services in Southern Jutland, Psychiatric Hospital Region of Southern Denmark has offered Open Dialogue network meetings to young people and their family following an acute referral or an acute self-referral to the Child and Adolescent Mental Health Services. Data collected in the clinics were linked with national register data. Each citizen in Denmark has a unique personal identification number, which is used in public administrative registers to record deliveries of health or social services (Erlangsen and Fedyszyn, 2015). This offers unique opportunities to link data across multiple registers (Munk-Jørgensen and Østergaard, 2011). In this study, we obtained data extracts from the Danish Psychiatric Central Research Register (Mors et al., 2011), the Danish National Patient Register (Lynge et al., 2011), the Danish Civil Registration System (Pedersen, 2011), the Danish National Health Service Register (Andersen et al., 2011), the Danish National Prescription Registry (Kildemoes et al., 2011), the Danish Education Register (Jensen and Rasmussen, 2011), and various social registries.

Participants

The participants consisted of all young people aged 14-19 and resident in Haderslev, Aabenraa, Tønder or Sønderborg municipality in Region of Southern Denmark who contacted Child and Adolescent Mental Health Services due to acute crisis and received the Open Dialogue intervention between March 2000 and December 2014. These patients' mental health problems included suicidal behaviour, psychotic symptoms, and social isolation caused by depression or anxiety. The second author performed an audit trail of the patients' medical records and identified the participants in the intervention group who were defined as patients receiving at least one Open Dialogue network meeting within 14 days of the first contact with the psychiatric system.

The comparison group consisted of patients in the same age range as the intervention group, who, in the same period, received standard acute psychiatric treatment from the Child and Adolescent Mental Health Services, in two other Danish Regions, Central Denmark Region and North Denmark Region, where Open Dialogue was not offered. The comparison group was identified using register data.

Intervention

The intervention was derived from the seven Open Dialogue principles and the aim was to prevent inappropriate hospital admissions by means of timely network meetings mobilising the patient's social network. A network meeting included participation by the patient, a minimum of one other member of the patient's social network, and two experienced therapists with a background in psychology, psychiatry, nursing, or social work with a special interest in family intervention and Open Dialogue. The number of network meetings varied based on the

specific needs of the patient; ranging in numbers from one to ten while three to four meetings were the norm. Treatment and treatment planning were also needs-adapted, and various other methods of mental health intervention were organized in an integrated treatment process. Network meetings usually took place in the patient's home, but could also take place at the patient's school, workplace, or at the municipality. As an integrated part of the network meeting, the two therapists would on one or more occasions ask for permission to 'turn towards one another' and reflect on what resonated with them in the previous conversation while the patient and next of kin listened. Subsequently, the therapists asked them for their thoughts about these reflections. Therapists strived towards adopting an open-ended, non-directive, and non-pathologising language-use and, if possible, all significant decisions, such as initiation of medical treatment or hospital admission, were discussed collaboratively at length during the meetings to optimise transparency in the process. This type of therapy has consistently been offered as standard care in Haderslev, Aabenraa, Tønder or Sønderborg municipality in Region of Southern Denmark since 2000. Its implementation was initiated through a special seed grant from the Danish Government, motivated by local staff who have maintained the effort over the years.

Standard treatment

Conventional acute psychiatric treatment, as offered in the Central and North Denmark Regions, generally consist of a few outpatient consultations with rare referrals to hospital admission. An interdisciplinary team that included a medical doctor and other professionals, e.g. a psychologist, a mental health nurse, a teacher, or a social worker, would examine the individual patient in order determine a potential diagnosis but also to assess acuity, risk and

severity. If no urgencies necessitate hospital admission, the outcome of these outpatient consultations would result in decisions regarding further treatments at home, typically organised in collaboration between the patient's general practitioner, a schoolteacher, a psychologist, and a social worker.

Follow-up

For the intervention group, the time of inclusion (t_0) was the date of the first Open Dialogue treatment. For the comparison group, t_0 was the date of the first treatment contact, either an emergency department, inpatient, or outpatient contact; i.e. resembling the spectrum of psychiatric contacts for which the intervention was offered. Due to data availability, the follow-up period was set to minimum one year with December 31st 2014 as end of follow-up unless death or emigration was recorded prior to this.

Outcomes

The primary outcome was the patients' utilisation of psychiatric health services, defined as total number of: psychiatric hospitalisations, days of psychiatric hospitalisation, psychiatric outpatient treatments, and emergency psychiatric treatments. Information on these outcomes were obtained from the Danish Psychiatric Central Research Register (Mors et al., 2011).

Secondary outcomes were the utilisation of general practitioner services, patients' utilisation of social services, educational status, employment status, suicide attempt, and the parents' utilisation of general practitioner services. The utilisation of health services at the general

practitioner was measured as the number of general practitioner services used annually. These data were retrieved from the Danish National Health Service Register (Andersen et al., 2011). Social services usage was assessed through data on foster care placements and preventive measures initiated by municipal caseworkers from the Register of Support for Disadvantaged Children and Young People (Danmarks Statistik, 2015). We used data from the Populations' Education Register (Jensen and Rasmussen, 2011) and the ISCED 2011 (UNESCO, 2012) to measure and classify educational status. 'Not working' was operationally defined as persons recorded as receiving public transfer payments, disability pension, sickness benefit or unemployment benefits. These data came from the Danish Income Statistics Register (Baadsgaard and Quitzau, 2011). Suicide attempts were identified as recorded in from both psychiatric and physical health registers. (For specific details regarding data sources and definitions of the outcomes, see available online appendix, Table S1).

Statistical methods

Propensity score matching was applied to select a matched comparison group that resembled the participants on relevant observed variables (Austin, 2011). Propensity scores were estimated using logistic regression. We matched in a 3:1 ratio using a nearest neighbour algorithm, no replacement, and no calliper threshold (Leuven and Sianesi, 2015). Differences between the intervention group and the matched comparison group were evaluated using standardized mean differences, the Kolmogorov-Smirnov test of equality between empirical distributions of the propensity scores, and visual inspection of kernel density functions of the propensity scores.

Matching factors were selected to ensure that participants and comparisons resembled each other with respect to relevant covariates, such as known risk predictors and outcome measures, at the time of inclusion. The following factors were used for the matching: gender, age, calendar year of inclusion, psychiatric diagnoses (schizophrenia spectrum disorders: F20-F29; affective disorders: F30-F39; anxiety and related disorders; F40-F48; any: F00-F99), psychiatric history before inclusion (no. of hospitalisations, days hospitalised, psychiatric outpatient treatment, emergency psychiatric treatments and suicide attempts), number of general practitioner services used, education completed (primary school, high school), socio-economic status (in school, employed or not working: unemployment benefits/disability pension), social interventions (foster care placements, preventive measures), family type (nuclear family, fusion household, single parent, living with partner/roommate, or in own single household), parent status (one or both missing in registers, one or both dead at inclusion), parents' diagnosis (binary indicators of at least one parent with: schizophrenia, affective disorders, anxiety, an indicator of at least one parent with previous suicide attempt registered, a count of parents' total number of different diagnosis registrations (FX-level)), parents' substance abuse (a substance abuse score counting one point for each parent with redeemed N07BB prescriptions at the time of inclusion and for each parent registered with a F1X diagnosis before baseline), parents' use of general practitioner services, parents' highest education (elementary school; high school; short tertiary, tertiary, academic) and parents' unemployment status (one not working, both not working).

Binary outcomes, i.e. foster care placement, preventive measure, and first suicide attempt, were analysed using logistic regression while Poisson regression with robust standard error estimation was used for count outcomes, i.e. psychiatric hospitalisations, days of psychiatric

hospitalisation, psychiatric outpatient treatments, emergency psychiatric treatments, general practitioner services used, secondary education achieved, and unemployment status. We employed Kaplan-Meier survival curves and Cox regression to evaluate the risk of psychiatric hospitalisation, psychiatric outpatient treatment, emergency psychiatric treatment and attempted suicide during a five years follow-up period. Censoring was applied after the first registered incident. For the analysis of parent's use of general practitioner services, a random effects parameter was added to the Poisson regression in order to account for the non-independence of children nested in parents. Two sided tests with a 5% significance level were used. Data analysis was carried out using Stata 14 (StataCorp, 2015).

Ethics

The study was approved by the Danish Data Protection Agency (No. 15/38885). Furthermore, the Danish Health and Medicines Authority approved access to hospital records as a part of the data collection (No. 3-3013-1205/1/). This study adhered to the instructions given by The Regional Committees on Health Research Ethics for Southern Denmark.

Results

The Open Dialogue intervention was offered to a total of 530 patients in the Region of Southern Denmark during 2010-2014. Of those, 27 were excluded because of invalid PIN numbers, hence the total number of participants were 503. The 43 patients included in 2014

were observed for less than one full calendar year and therefore, the sample for the one-year follow up was reduced to 460 cases.

The comparison group consisted of a total of 19240 patients with an outpatient consultation or admission at the Department of Child and Adolescent Mental Health Services in adjacent regions. Among these, 151 were excluded due to less than one full calendar year after inclusion. Using a 1:3 ratio, 1509 individuals were matched to the 503 participants based on their propensity scores. The Kolmogorov-Smirnov test showed no significant differences between groups in the distribution of propensity scores ($p=0.995$); supported by the kernel densities, see available online appendix, Figure S1. As seen in Table 1, the participants and matched comparison group resembled each other on characteristics and examined outcomes at baseline; i.e. only in 3 out of 41 factors did the standardised difference in proportions exceed 0.05.

[Insert Table 1 here]

As seen in the results of the logistic regression analysis (Table 2), there was no significant reduction in the number of psychiatric hospitalisation contacts or treatment days (Figure 1). Nevertheless, a 24 per cent higher rate of outpatient contacts was noted among participants receiving the Open Dialogue intervention at one year of follow-up (RR=1.24, CI: 1.07-1.44), but not at the subsequent follow-ups. The probability of later needing emergency psychiatric treatments was significantly lower among participants than for the matched comparison group. After one year, participants had a 79 per cent lower rate of emergency psychiatric

treatments (RR = 0.21, CI: 0.09-0.50) than the comparison group, which gradually declined to a 52 per cent reduction at 10 years of follow-up (RR = 0.48, CI: 0.27-0.85).

[Insert Figure 1 here]

[Insert Table 2 here]

A 10 per cent reduction in usage of general practitioner services was observed at 1 year of follow-up (RR = 0.90, CI: 0.82-0.99), which increased to a 15 per cent reduction at 10 years of follow-up (RR = 0.85, CI: 0.78-0.92).

No difference between the groups was observed for suicide attempts. At 2 years of follow-up, a significant 26 per cent lower rate of unemployment (RR = 0.74, CI: 0.57-0.96) was observed; similar reductions were found after 10 years (RR = 0.77, CI: 0.66-0.89). Although a higher share of participants than comparisons were found to obtain secondary education or higher, 28% vs. 25% at 10 year follow-up, the difference did not reach statistical significance (RR: 1.12, CI: 0.98-1.28).

The time-to-event analysis displayed in Figure 2 assessed the time from inclusion to the first observed utilisation of psychiatric healthcare services and suicide attempt. There was no significant difference in the probability of psychiatric hospitalisation (HR = 1.17, CI: 0.89-1.52) or psychiatric outpatient treatment (HR = 1.05, CI: 0.89-1.24). However, the persons in the intervention group were significantly less likely to require emergency psychiatric

treatment than those in the comparison group (HR = 0.29, CI: 0.17-0.50) during the first 5 years. No significant differences in the frequency of suicide attempt were noted.

[Insert Figure 2 here]

The rates of parents' visits to general practitioner were not significantly or substantially different between the two groups at any of the four follow up intervals considered (i.e. at 1 year of follow-up: RR = 1.00, CI: 0.91-1.10 and at 10 years of follow-up: RR = 0.98, CI: 0.85-1.12).

Discussion

To our knowledge, this is the first large-scale, long-term register linkage study examining associations between Open Dialogue and young people's utilisation of health services and social services. We found that patients receiving the intervention had an increased utilisation of psychiatric outpatient treatments at one year of follow-up, but a reduced frequency of emergency psychiatric treatment and general practitioner services than matched peers throughout the 10-year observation period.

Our findings add support to the small-scale cohort studies from Finland, where a short-term follow-up linked the intervention to fewer days spend in psychiatric hospitalisation when compared to different control groups (Seikkula et al., 2006, Seikkula et al., 2011, Seikkula et al., 2003). However, this finding was not confirmed at five-year follow-up (Seikkula et al., 2006). The Danish study did not note between-group differences with respect to psychiatric

hospitalizations or days of psychiatric hospitalisation. We also observed substantial reductions of in use of emergency psychiatric treatment among Open Dialogue recipients that remained significant at the 5-year follow-up. It is possible that the intervention influenced the illness behaviour of the young recipients and their social network; potentially they might have learned to access and use psychiatric emergency services differently.

The participants had lower rates of using general practitioner services in the follow-up period than the comparison group. While the reduction was relatively modest compared to those of emergency psychiatric treatment, the absolute difference in rates was substantial, i.e. 1,468 vs. 1,729 per 100 person-years at 10 years of follow-up, equivalent to a total of 9,361 fewer contacts to general practitioner among 503 patients ((156,903/3)-42,940). We did not include a formal health economic analysis, but this reduction of general practitioner services suggests substantial cost savings.

In one of the three cohort studies, Seikkula et al. (2003) found that patients in the Open Dialogue intervention groups, experienced significant improvements with work and education, when compared to control groups at two-year follow-up. In the present study, we noted changes in favour of employment status in the intervention group at later follow-up points, which could indicate better social integration, as also suggested by Lehman (1995). This is somewhat unexpected, as the Danish intervention did not include a specialised effort directed towards employment. However, considering the emphasis on strengthening family and social networks these outcomes could be considered the result of improved individual, family, and social network functioning. The fact that we did not measure a significant difference with respect to education, social interventions, and suicide attempts could be

related to the limited scope of the intervention, which was not specifically targeting these issues, or the sample size.

The long-term reductions in psychiatric emergency treatment and general practitioner services indicate that ‘overuse’ of health care services was avoided and that the probability of ‘overmedicalization’ (Brownlee et al., 2017) of young people experiencing mental health problems was minimized. Although the intervention may have been too brief to significantly influence wider groups of patients and their families, it resonated very well with Patel et al.’s (2007) call for more ‘youth-friendly’ specialized interdisciplinary early intervention services.

Strengths and limitations

Strengths of the study include the unique Danish personal identification number that made it possible to link clinical and administrative register data, allowing for a propensity score matching, a complete coverage, and no loss to follow-up. The same data sources were used for intervention and comparison group with respect to matching factors and outcomes, hence, improving consistency of findings. Finally, the sample was large and the long-term follow-up timespan covered a large spectrum of outcomes.

No internationally accepted fidelity criteria exist for Open Dialogue, which is probably due to the nature of the need-adapted treatment philosophy (Olson et al., 2014) and the locally adopted clinical practices may have varied compared to other sites (Buus et al., 2017). There were no available data on the level of fidelity to the local practices, but all initial Open Dialogue network meetings took place within two weeks after first contact, all network

meetings took place away from the Child and Adolescent Mental Health Services, and they included two therapists, which satisfies some of the basic features of Open Dialogue provision. The particular Danish Open Dialogue intervention under investigation was brief and based on outpatient treatment; it was not tailored specific diagnoses and targeted young people as they were having their first acute contacts with the mental health services; and it did not include an extensive integrated care approach as in the original Finnish settings, and comparisons of outcomes must be interpreted in that particular treatment context. Likewise, due to study design we cannot make statements regarding causal associations.

Although Danish psychiatric register data generally are evaluated as having a good validity, incomplete registration, and changing definitions cannot be excluded (Mors et al., 2011). Another important limitation was that clinical data are potentially susceptible to local practices of diagnosing and record-keeping (Munk-Jørgensen and Østergaard, 2011). Moreover, although the matching procedure intended to adjust for it, the results could be influenced by unobserved covariates, such as substance abuse, severity of disorder, or willingness for treatment, which potentially could introduce confounding effects. Furthermore, some variables, e.g. medication use and substance abuse, were not available or only through an unreliable proxy. Finally, the particular control-group design, comparing Open Dialogue approach to conventional psychiatric treatment, can be critiqued for adding to the effect estimates. Both case and comparison group were included in the study sample on the date that best marked the time of initiation of treatment. However, due to differences in referral practices in the two groups a slight variation in time of inclusion could not be avoided. Future research should ideally be designed as randomised or cluster randomised controlled trials in a variety of treatment settings in order to yield a higher level of evidence.

Such trials could be paralleled by detailed observational research designs, for instance, Conversation Analysis, to explore how ‘dialogical’ psychotherapy (Seikkula and Arnkil, 2006) is orchestrated during network meetings. Finally, future cost-effectiveness analyses that include the costs of training and supervision are called for.

In terms of clinical implications, it is important to note that providing a more sustainable and extensive support, i.e. a collaborative psychosocial intervention to young people in psychiatric crisis and their family, might secure lasting effects on service use. In general, early intervention programs include some level of family engagement, but these mainly focused on information sharing and psychoeducation, while therapeutic family engagement is being reserved for more complex presentations. The immediate and active involvement of families and social networks in the Open Dialogue approach might generate psychosocial resources that are not provided through conventional psychiatric treatment programs and could augment the outcomes of such treatment programs.

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All authors have made substantial contributions to all of the following: (1) the conception and design of the study, or acquisition of data, or analysis and interpretation of data, (2) drafting the article or revising it critically for important intellectual content, (3) final approval of the version to be submitted.

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ACCEPTED MANUSCRIPT

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Figures and tables

Figure 1: Ratio estimates

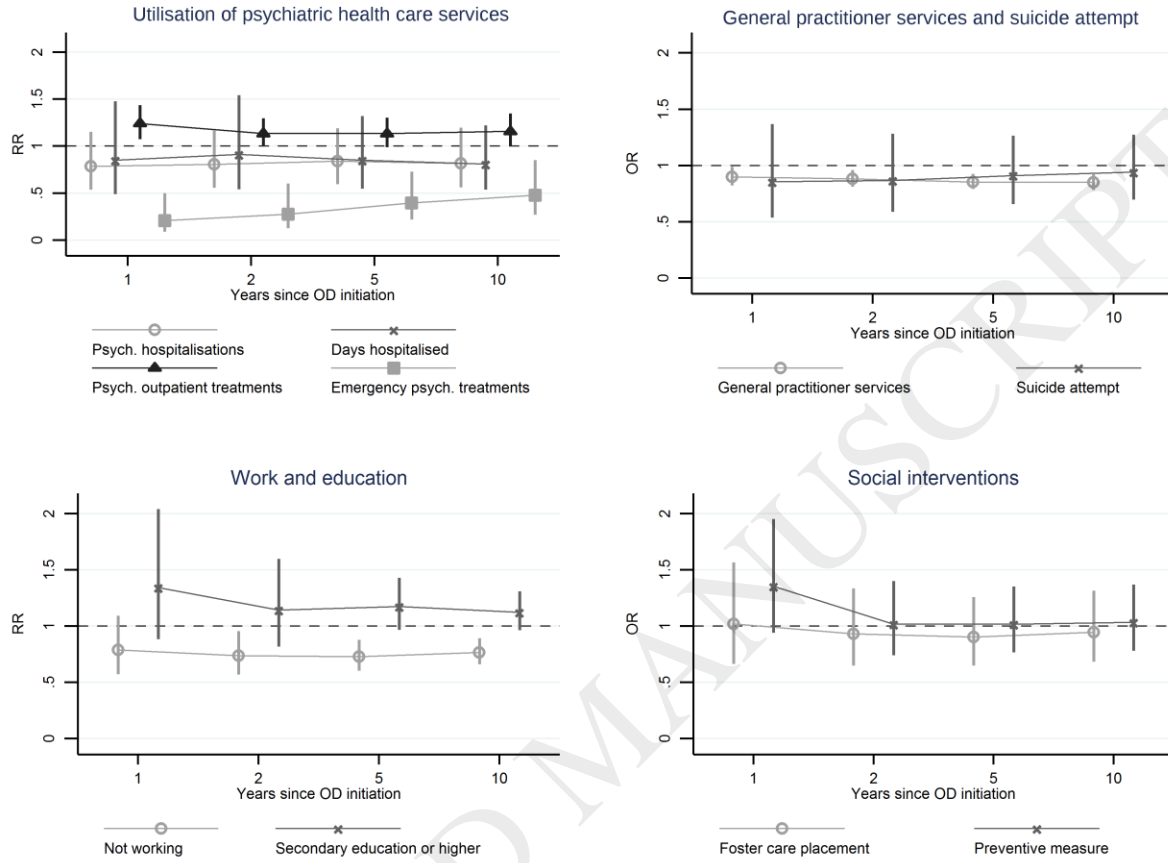


Figure 2: Survival graphs

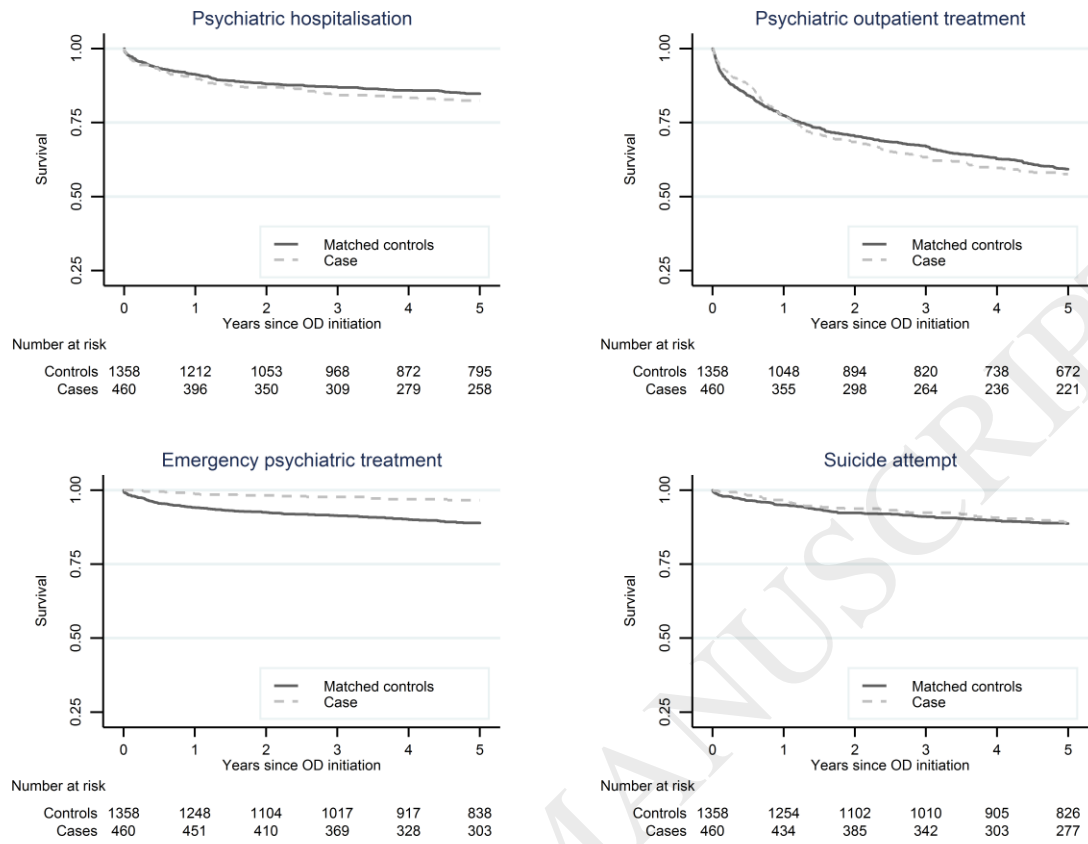


Table 1: Propensity score matching factors – all measured before or at baseline

	Participants (n=503)		Comparison group (n=19240)		Matched comparison group (n=1509)		
	Mean / n	SD / %	Mean / n	SD / %	Mean / n	SD / %	Std. diff.
Demographics							
Male (n/%)	142	28.23	7469	38.82	402	26.64	0.04
Age (mean/SD)	16.28	1.62	16.59	1.69	16.24	1.62	0.03
Year of inclusion (mean/SD)	2007.36	4.28	2008.37	4.27	2007.34	4.50	0.00
Diagnosis							
Schizophrenia spectrum disorders (n/%)	34	6.76	1066	5.54	97	6.43	0.01
Affective disorder (n/%)	174	34.59	3938	20.47	547	36.25	0.03
Anxiety disorder (n/%)	317	63.02	6851	35.61	956	63.35	0.01
Any psychiatric diagnosis (n/%)	469	93.24	17250	89.66	1406	93.17	0.00
Psychiatric history^{a)}							
Hospitalisations (mean/SD)	0.09	0.57	0.04	0.70	0.07	0.47	0.03
Days hospitalised (mean/SD)	1.89	22.71	1.72	24.11	1.42	12.84	0.02
Psychiatric outpatient treatments (mean/SD)	0.39	0.94	0.07	0.37	0.31	0.77	0.09
Emergency psychiatric treatment (mean/SD)	0.04	0.35	0.01	0.45	0.03	0.37	0.01
Suicide attempts ^{b)} (mean/SD)	0.02	0.15	0.00	0.08	0.02	0.14	0.03
Use of general practitioner services							
Log of GP services used ^{c)} (mean/SD)	2.68	0.72	2.52	0.86	2.70	0.71	0.02
Education completed							
Primary school (n/%)	454	90.26	17283	89.83	1354	89.73	0.02
High school (n/%)	15	2.98	677	3.52	54	3.58	0.04
Socio-economic status							
In school (n/%)	453	90.06	16854	87.60	1343	89.00	0.04
Employed (n/%)	29	5.77	1253	6.51	107	7.09	0.06
Not working: unemployment benefits/disability	21	4.17	1133	5.89	59	3.91	0.01

pension) (n/%)							
No. of social interventions							
Foster care placements (mean/SD)	0.29	0.92	0.28	0.90	0.26	0.86	0.03
Preventive measures (mean/SD)	0.33	0.74	0.27	0.68	0.29	0.67	0.05
Family type							
In nuclear family (n/%)	205	40.76	7881	40.96	634	42.01	0.03
In fusion household ^{d)} (n/%)	278	55.27	10835	56.31	835	55.33	0.00
With single parent (n/%)	141	28.03	4756	24.72	412	27.30	0.02
With partner (n/%)	14	2.78	535	2.78	47	3.11	0.02
Own place (n/%)	206	40.95	7771	40.39	606	40.16	0.02
Parent status							
One or both parents missing (n/%)	21	4.17	590	3.07	73	4.84	0.03
One or both parents dead (n/%)	15	2.98	528	2.74	41	2.72	0.02
Parents' diagnoses							
Schizophrenia ^{e)} – DF2X (n/%)	12	2.39	318	1.65	40	2.65	0.02
Affective disorder ^{e)} – DF3X (n/%)	44	8.75	1337	6.95	125	8.28	0.02
Anxiety disorder ^{e)} – DF4X (n/%)	43	8.55	1264	6.57	117	7.75	0.03
At least one parent with previous suicide attempt (n/%)	9	1.79	248	1.29	24	1.59	0.01
Parents' total number of psychiatric diagnoses ^{f)} (mean/SD)	0.31	0.82	0.26	0.76	0.29	0.81	0.03
Parents' substance abuse							
Parents' addiction score ^{g)} (mean/SD)	0.08	0.32	0.06	0.28	0.09	0.34	0.01
Parents' use of general practitioner services							
Log of parents use of GP ^{c)} (mean/SD)	2.37	0.80	2.32	0.81	2.35	0.81	0.03
Parents highest education^{h)}							
Elementary school (n/%)	99	19.68	3334	17.33	284	18.82	0.02
High school (n/%)	255	50.70	9041	46.99	791	52.42	0.03

Short tertiary (n/%)	21	4.17	986	5.12	62	4.11	0.00
Tertiary (n/%)	110	21.87	4032	20.96	327	21.67	0.00
Academic (n/%)	12	2.39	1425	7.41	28	1.86	0.03
Parents unemployment status							
One (n/%)	153	30.42	5767	29.97	452	29.95	0.01
Both (n/%)	62	12.33	2427	12.61	178	11.80	0.02

Note: All continuous and count factors are used with an additional quadratic term in the matching model. For binary indicators and categories with no mutual exclusion, the reference group is defined by absence of the factors measured. ^{a)} The number of psychiatric contacts before Open Dialogue initiation. ^{b)} No. of suicide attempts registered in the Psychiatric Central Research Register. ^{c)} Natural log of 1+ the number of GP services used. ^{d)} Household with two adults of which only one is the parent of the patient. ^{e)} Proportion with at least one parent with the specified diagnosis. ^{f)} Each ICD-10 DFX subgroup counts as one (max. 10 for each parent). ^{g)} Addiction score (range: 0 to 4). One point for each parents using N07BB prescription medicine against alcoholism at baseline and one point for each parent registered with a DF1X diagnosis before baseline. ^{h)} The highest educational level observed for each pair of parents.

Table 2: Events, person-years, and rates (per 100 person-years) for all outcomes

	Cases			Comparison group			Matched comparison group			
Years of follow up	Events	Person-years	Rate	Events	Person-years	Rate	Events	Person-years	Rate	
Psychiatric hospitalisations										
1	66	460	14.3	2718	16793	16.2	248	1358	18.3	
2	115	878	13.1	4605	31426	14.7	420	2584	16.3	
5	246	1911	12.9	9320	65671	14.2	878	5729	15.3	
10	375	2924	12.8	13838	96613	14.3	1423	9075	15.7	
Days of psychiatric hospitalisation										
1	1637	460	355.9	90082	16793	536.4	5689	1358	418.9	
2	3268	878	372.2	141226	31426	449.4	10540	2584	407.9	
5	5751	1911	300.9	257764	65671	392.5	20290	5729	354.2	
10	7921	2924	270.9	358854	96613	371.4	30386	9075	334.8	
Psychiatric outpatient treatments										
1	287	460	62.4	9224	16793	54.9	682	1358	50.2	
2	426	878	48.5	13838	31426	44.0	1105	2584	42.8	
5	718	1911	37.6	22212	65671	33.8	1898	5729	33.1	
10	980	2924	33.5	28858	96613	29.9	2627	9075	28.9	
Emergency psychiatric treatments										
1	10	460	2.2	1624	16793	9.7	142	1358	10.5	
2	23	878	2.6	2872	31426	9.1	246	2584	9.5	
5	72	1911	3.8	5681	65671	8.7	544	5729	9.5	
10	143	2924	4.9	8174	96613	8.5	926	9075	10.2	
Number of general practitioner services used										
1	6709	460	1458.5	239041	16793	1423.5	22013	1358	1621.0	
2	12340	878	1405.5	449700	31426	1431.0	41242	2584	1596.1	
5	27077	1911	1416.9	965317	65671	1469.9	95031	5729	1658.8	
10	42940	2924	1468.5	1468745	96613	1520.2	156903	9075	1729.0	
Foster care placement (excl. repeated events)										
1	30	460	6.5	869	16793	5.2	87	1358	6.4	
2	41	850	4.8	1232	30622	4.0	129	2500	5.2	
5	47	1761	2.7	1438	61489	2.3	155	5255	2.9	
10	48	2635	1.8	1438	88512	1.6	155	8067	1.9	
Preventive measure (excl. repeated events)										
1	46	460	10.0	1008	16793	6.0	103	1358	7.6	
2	54	838	6.4	1558	30565	5.1	158	2491	6.3	
5	67	1741	3.8	1981	61039	3.2	198	5234	3.8	
10	67	2632	2.5	2008	88223	2.3	200	8111	2.5	
Secondary education or higher completed										
1	30	460	6.5	1227	16793	7.3	66	1358	4.9	

	2	73	878	8.3	2964	31426	9.4	188	2584	7.3
	5	344	1911	18.0	10931	65671	16.6	878	5729	15.3
	10	823	2924	28.1	23418	96613	24.2	2273	9075	25.0
Not working (unemployed or receiving sickness benefit/pension)										
	1	42	460	9.1	2114	16793	12.6	157	1358	11.6
	2	94	878	10.7	4893	31426	15.6	375	2584	14.5
	5	320	1911	16.7	14898	65671	22.7	1317	5729	23.0
	10	670	2924	22.9	27634	96613	28.6	2714	9075	29.9
Suicide attempt (excl. repeated events)										
	1	24	460	5.2	743	16793	4.4	82	1358	6.0
	2	34	858	4.0	989	30748	3.2	114	2510	4.5
	5	48	1805	2.7	1389	62236	2.2	155	5325	2.9
	10	57	2717	2.1	1585	89205	1.8	181	8132	2.2