

Review of health and risk-behaviours, mental health problems and suicidal behaviours in young Europeans on the basis of the results from the EU-funded Saving and Empowering Young Lives in Europe (SEYLE) study

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Summary

An estimated 800 000 suicide deaths occur worldwide. The global suicide rate is 11.4 per 100 000 population; 15.0/100 000 for males and 8.0/100 000 for females. Globally, suicide is the second leading cause of death in 15–29 year olds. In a collaborative effort to reduce the high rates of suicide and mental health problems among youth across Europe, the European Union 7th Framework funded the Saving and Empowering Young Lives in Europe (SEYLE) project. SEYLE is a randomized controlled trial (RCT) aimed to promote mental health and healthy lifestyles, while preventing psychopathology and suicidal behaviours among adolescents. The epidemiological data on 11,110 pupils in the age group 14–16 years, with a mean age of 14.8 years ($SD \pm 0.8$), who were recruited from 168 schools across 10 European Union countries: Austria, Estonia, France, Germany, Hungary, Ireland, Italy, Romania, Slovenia and Spain, with Sweden as the coordinating centre showed the following prevalences: alcohol use (13.4%), smoking (30.9%), physical inactivity (32.8%), pathological Internet use (4.4%) and sleeping on average 7.7 hours per night. In terms of reproductive health, the prevalence of sexual debut was 18.8% for the total sample. Pupils aged ≥ 16 years had a higher prevalence (38%) of sexual debut compared to those aged ≤ 15 years (13.2%). Males had a higher prevalence (21.3%) than females (16.9%). Three clusters of adolescents were identified: 57.8% with low frequency of all risk-behaviours; 13.2% with high frequency of all risk behaviours; and 29% so-called ‘invisible’ risk group, which did not show any striking externalised risk behaviours, but scored positive for high use of Internet/TV/videogames, sedentary behaviour and reduced sleep. When comparing pupils in the ‘invisible’ risk group with those in the high-risk group, similar prevalence rates of anxiety (8% vs. 9.2%), subthreshold depression (33.2% vs. 34%), depression (13.4% vs. 14.7%) and suicidal thoughts (42.2% vs. 44%) were observed. Pupils meeting the criteria of depression and subthreshold depression were 10.5% and 32%, respectively. Prevalence rates for anxiety and subthreshold anxiety was 5.8% and 29.2%, respectively. Lifetime prevalence of deliberate self-injurious behaviours (D-SIB) was 27.6%, with higher rates reported for occasional D-SIB (19.7%) compared to repetitive D-SIB

(7.8%). Suicidal ideation was present in approximately one third of the sample (32.3%). More than four percent (4.2%) of the sample reported attempting suicide during their lifetime, with a significantly higher prevalence among girls (5.1% vs. 3.0%, $p < 0.05$). In comparing the effectiveness of the three active SEYLE interventions, based on three specific preventive strategies directed towards teachers and school staff, professionals and pupils in comparison to a control group, the intervention empowering pupils, called the Youth Aware of Mental Health (YAM) showed significant results in preventing new cases of suicide attempts, severe suicidal ideation with plans and depression. More than a 50% reduction of incident cases of suicide attempts (OR: 0.45 [0.24 – 0.85]; $p = 0.014$), and of incident cases of severe suicidal ideation and plans (OR: 0.50 [0.27 – 0.92]; $p = 0.025$), as well as a significant reduction by 30% of incident cases with moderate to severe depression (OR: 0.71 [0.52– 0.97]; $p = 0.031$) was observed.

Key words: SEYLE, risk-behaviours, suicide attempts

Introduction

I had the pleasure to join the 45th Meeting of Polish Psychiatrists during 16–18 of June 2016 in Katowice at the very modern conference centre. The theme of the conference was ‘Individual, family and mental health’. My inauguration lecture was placed between the excellent performances of an old orchestra of coalminers in their traditional and decorative uniforms (consisting of a black suit and a hat with either a white, red or black feather depending on the rank of the miner) and the spectacular performance of the famous Polish National Song and Dance Ensemble “Śląsk”. Music and dances were full of energy and enjoyment conveyed with forcefulness and hope, which are important qualities for growing adolescents that build the foundation for the future.

Suicide – a priority for World Health Organization

An estimated 800 000 suicide deaths occur worldwide. The global suicide rate is 11.4 per 100 000 population; 15.0/100 000 for males and 8.0/100 000 for females. Globally, suicide is the second leading cause of death in 15–29 year-olds. Suicide rates are highest in persons aged 70 years or over for both men and women in almost all regions of the world. For each adult who dies by suicide, there are more than 20 others who make a suicide attempt [1].

Saving and Empowering Young Lives in Europe (SEYLE) study

The focus of my lecture was the summary of the findings from the Saving and Empowering Young Lives in Europe (SEYLE) project, funded by the European Union FP7 Programme with €3 million, which I led as the Principal Investigator (PI). SEYLE results on health and risk-behaviours, as well as the preventive programme called Youth Aware of Mental Health (YAM), fitted very well with the theme of the

conference, as the health of adolescents influences the well-being of the family and vice-versa.

SEYLE is a randomized controlled trial (RCT) aimed to promote mental health and healthy lifestyles, while preventing psychopathology and suicidal behaviours among adolescents. The study involved 11,110 pupils in the age group 14–16 years, with a mean age of 14.8 years ($SD \pm 0.8$), who were recruited from 168 schools across 10 European Union countries: Austria, Estonia, France, Germany, Hungary, Ireland, Italy, Romania, Slovenia and Spain, with Sweden as the coordinating centre. In some studies, Israel was also involved, which increased the numbers of pupils to approximately 12,000 (Figure 1). Besides collecting epidemiological data, an evaluation was conducted to assess the effectiveness and efficacy of the active preventive interventions, based on three specific preventive strategies directed towards teachers and school staff, professionals and pupils in comparison to a control group [2, 3].



Figure 1. Consortium of the SEYLE project

Health and risk behaviours

In the SEYLE project, data were collected in regard to health and risk-behaviours, mental health and suicidality. In regard to health and risk-behaviour factors, the following information was screened: sleep, weight, physical activity, use of the Internet/TV/videogames, alcohol use, illegal drug use, smoking and truancy. In a latent class

analysis, Carli et al. [4] identified three clusters of the adolescent sample, categorized as: low-risk (57.8%) with low frequency of all risk behaviours, high-risk (13.2%) who scored high on all risk behaviours and 'invisible' risk group (29%) who scored positive for high use of Internet/TV/videogames for reasons not related to schoolwork, sedentary behaviour and reduced sleep.

When comparing pupils in the 'invisible' risk group with those in the high-risk group, similar prevalence rates of anxiety (8% vs. 9.2%), subthreshold depression (33.2% vs. 34%), depression (13.4% vs. 14.7%) and suicidal thoughts (42.2% vs. 44%) were observed. Results also showed that the prevalence of suicide attempts was 1.7% in the low-risk group, 5.9% in the 'invisible' risk group and 10.1% in the high-risk group.

Physical activity

Results showed that a minority of the sample (17.9% of boys and 10.7% of girls; $p < 0.0005$) reported sufficient activity based on WHO guidelines of at least 60 min of daily moderate-to-vigorous activity. 30% reported participation in at least one team sport, with large sex differences (19.0% of girls, 46.6% of boys; $p < 0.0005$). Just under one third of the sample (32.8%) reported no participation in sport or other fitness activity, while 37.0% reported participation in an individual sport or fitness activity, but no team sport. Frequency of physical activity was positively correlated with well-being and negatively correlated with both anxiety and depressive symptoms, up to a threshold of moderate frequency of physical activity. Increasing physical activity levels and sports participation among the least active young people should be a target of community and school-based interventions to promote well-being [5].

Sleep

Sarchiapone et al. [6] investigated the relationship between the number hours of sleep in adolescents and its association with mental health problems and suicidal ideation. Data analysis showed that pupils slept on average 7.7 hours per night during school days. Females tended to sleep fewer hours than males and an inverse relationship was observed between sleeping hours and age. Reduced sleep was significantly associated with emotional symptoms, conduct problems, anxiety and suicidal ideation.

Alcohol use

In SEYLE, data show that the prevalence of consuming alcohol 2 to 3 days per week among adolescents was 13.4%, with significantly higher rates observed in males compared to females ($M = 10.5\%$ vs. $F = 5.8\%$; $p < 0.0001$). Excessive alcohol use

among youth is often linked to their home life. Ruutel et al. [7] examined a SEYLE sample and showed that pupils abstaining from alcohol were higher in families with both parents compared to other family structures. Moreover, adolescents witnessing a family member drunk tend to drink alcohol themselves.

Smoking

The prevalence of smoking in European adolescents is relatively high (30.9%) and varies widely between countries. The majority (58.0%) reported that the onset of smoking occurred prior to the age of 14 years. In a sample of 12,328 European adolescents in SEYLE, findings revealed that smoking was significantly associated with emotional symptoms, conduct problems, hyperactivity, excessive alcohol and illicit drug use, anxiety and previous suicide attempts [8]. The interaction between psychosocial factors and adolescent smoking are highly correlated with parental behaviours and family structure. The study concluded that the early onset and long-term smoking are associated with both physical and psychological health problems.

Internet use

Internet use was measured using the Young Diagnostic Questionnaire (YDQ). The YDQ measurements are based on a pattern of Internet use, over the past 6 months, resulting in clinical impairment or distress. These symptoms include: a) use Internet longer than intended, b) preoccupation with the Internet, c) withdrawal symptoms when unable to access the Internet, d) unsuccessful attempts to stop or reduce Internet use, e) craving, f) loss of interest in hobbies or activities other than the Internet, g) excessive Internet use despite the knowledge of related problems, h) use of the Internet to escape or relieve a negative mood, and i) lying about Internet use. The criteria are evaluated through the respective eight 'yes' or 'no' questions, with a total score ranging from 0 to 8. Based on the YDQ, pupils were categorized as adaptive Internet users (AIU; YDQ score: 0–2), maladaptive Internet users (MIU; YDQ score: 3–4) and pathological Internet users (PIU; YDQ score: ≥ 5) [9]. The highest ranked online activities were watching videos, visiting chat rooms and social networking. Playing online games was higher in males, while social networking was higher in females.

The prevalence of MIU and PIU was 13.5% and 4.4%, respectively. Females (14.3%) had higher rates than males (12.4%) in the MIU group, whereas males had higher rates (5.2%) than females (3.8%) in the PIU group (Table 1). PIU was also shown to be higher in older adolescents, in those not living with a biological parent or relative, adolescents who have a parent or guardian that is unemployed, parents who do not pay attention to adolescent or they do not know what the adolescent does with his/her free time.

Table 1. Prevalence of maladaptive and pathological Internet use stratified by gender

Internet user group	Male		Female		Both genders	
	n	%	n	%	n	%
Maladaptive use	649	12.4	959	14.3	1610	13.5
Pathological use	269	5.2	256	3.8	528	4.4

In a follow-up study of PIU, Kaess et al. [10] assessed the association between PIU, psychopathology and suicidal behaviours. Results showed that PIU was significantly correlated with depression, conduct problems, hyperactivity, suicidal ideation and suicide attempts. Young people with PIU shared psychopathological factors with those having problematic alcohol use, in particular, depression and conduct problems [11].

Reproductive health

Reproductive health is important during adolescent development. Sexual debut was reported in 18.8% of the entire sample of 14–16 year old adolescents. Prevalence rates of sexual debut were 13.2% in pupils aged 15 years or younger compared to 38% in those aged 16 years and older. Males had a higher prevalence (21.3%) than females (16.9%). Early sexual debut was significantly associated with anxiety, depression, severe suicidal ideation and suicide attempts [12]. In a related SEYLE sample from Ireland on sexual orientation and mental health problems, outcomes showed that 5% of Irish adolescents reported having concerns regarding their sexual orientation. When compared to their peers, pupils with concerns regarding their sexual orientation had higher levels of physical assault (40% vs. 8%), attempted suicide (29% vs. 2%), frequent alcohol use (20% vs. 1%) and sexual assault (16% vs. 1%). Almost all of those (90%) with sexual orientation concerns reported having had sex compared to just 4% of their peers [13].

Bully and victimisation in adolescents and their mental health

There are several forms of bully and victimisation that negatively affect adolescents' mental health and well-being. The most common forms of bully and victimisation include physical abuse (hitting and kicking), verbal abuse (name calling and teasing), relational abuse (social exclusion and spreading negative rumours) and cyber abuse (posting hurtful text on social networks or upload embarrassing picture or videos). Victims affected by relational bullying have a substantially higher likelihood of attempting suicide compared to adolescents exposed to other forms of bullying. Findings showed that a 1-point increase in relational victimisation was associated with 28% increase of attempting suicide [14, 15].

Migration in adolescents

Immigration to a new land with a new language can be a stressful experience, particularly for adolescents. Studies show that immigrants tend to have a higher risk of substance abuse, depression, anxiety and suicidality compared to natives. In a SEYLE study among migrant adolescents in Europe, results showed that non-European migrants, regardless of migrant generation, have higher externalized symptoms compared to natives. Poorer self-perceived health was also significantly higher in first generation of non-European migrants compared to natives [16].

Psychopathology

Depression and anxiety

Balazs et al. [17] examined the prevalence and correlates of depression and sub-threshold depression, as well as anxiety and subthreshold anxiety, among adolescents in the SEYLE sample. Outcomes revealed that the prevalence of adolescents meeting the criteria of depression and subthreshold depression were 10.5% and 32%, respectively. The prevalence of anxiety and subthreshold anxiety was 5.8% and 29.2%, respectively. Subthreshold-anxiety, anxiety and depression were strongly correlated to functional impairment and suicidality.

Deliberate Self-injurious Behaviour (D-SIB) and suicidal behaviours

Deliberate self-injurious behaviour (D-SIB) refers to the intentional self-inflicted damage of the surface of an individual's body by self-cutting, – burning, – hitting, – biting, and skin damage by other methods. In a study conducted in Europe among 12,068 adolescents, Brunner et al. [18] investigated the lifetime prevalence of both occasional and repetitive D-SIB. Findings yielded a lifetime D-SIB prevalence of 27.6% with higher rates reported for occasional D-SIB (19.7%) compared to repetitive D-SIB (7.8%). In a comparison of countries, the study showed that the lifetime prevalence of D-SIB ranged from 17.1% to 38.6%. The lowest D-SIB rates were found in Hungary, Ireland, and Italy, whereas the highest rates were reported in Estonia, France, Germany (and Israel). Depression, anxiety and suicidality were strongly associated with both occasional and repetitive D-SIB.

Suicidal ideation was present in approximately one third of the sample (32.3%), with a significantly higher prevalence in older pupils and among girls (38.7% vs. 24.5%, $p < 0.05$). More than four percent (4.2%) of the sample reported attempting suicide during their lifetime, with a significantly higher prevalence among girls (5.1% vs. 3.0%, $p < 0.05$) [4].

Psychotic experiences

In a sample of 2,243 adolescents in the four Irish cohorts, including SEYLE, Kelleher et al. [19] investigated psychotic experiences (associated with mental illnesses) in non-psychotic pupils. Quantitative assessment comprised one question on auditory hallucinations ‘Have you ever heard voices or sounds that no one else can hear?’ from ‘Adolescent Psychotic Symptom Screener (APSS).’ This question seems to have a good predictive validity for psychotic symptoms. The qualitative level assessment included also the psychosis section of the Kiddie Schedule for Affective Disorders and Schizophrenia in order to assess psychotic symptoms. Findings showed that younger adolescents had a higher prevalence (21–23%) of psychotic symptoms than older adolescents (7%). Adolescents who reported psychotic symptoms were at particularly high risk of having multiple co-occurring diagnoses. Psychotic symptoms appear to be important risk markers for a wide range of non-psychotic psychopathological disorders.

In a prospective study conducted by the Irish SEYLE group, the aim was to assess psychotic symptoms and the population risk for suicide attempts among an adolescent sample (N = 1,112) [20]. In the total sample, 7% of adolescents reported psychotic symptoms at baseline. In this subsample, 7% reported a suicide attempt by 3 months vs. 1% of the rest of the sample and 20% reported a suicide attempt by 12 months vs. 2.5% of the rest of the sample. Adolescents with psychopathology who reported psychotic symptoms had nearly a 70-fold increased odds of acute suicide attempts. In a causative model, the population-attributable fraction of suicide attempts was calculated to be 56% to 75% for adolescents who experienced psychotic symptoms.

Preventive interventions in SEYLE schools in a randomized controlled trial (RCT)

Question, Persuade, Refer (QPR)

The QPR ‘preventive intervention’ programme, developed in the US (<http://www.qprinstitute.com>), focuses primarily on training gatekeepers to identify and intervene when individuals are engaged in risk behaviours. It involves posing questions to individuals concerning their behaviour, persuading them to seek help if they are displaying suicidal warning signs and, when appropriate, referring the individual to a treatment facility. Gatekeepers in the SEYLE study were teachers and school staff who were trained in general information on suicidal behaviour, training on risk factors and warning signs for suicide, myths and facts about suicide, how to ask and not ask questions, how to provide support and subsequent referral.

Youth Aware of Mental Health (YAM)

The YAM intervention is designed to promote knowledge about mental health, healthy lifestyles and behaviours among adolescents. All pupils in the classrooms are

provided with a customized educational, awareness-raising booklet covering six specific topics concerning: (1) awareness of mental health and health/risk behaviours; (2) self-help advice; (3) stress and crisis; (4) depression and suicidal thoughts; (5) helping a troubled friend; and (6) getting advice – who to contact. The booklet also includes telephone numbers and email addresses to local healthcare facilities and healthy lifestyle groups in case pupils wish to seek help. Once the intervention commences, six posters are hung in the classroom covering the six key topics as in the awareness booklets. Lessons, which are combined with role-play sessions, address the six topics covered in the awareness booklet and posters [21].

Professional Screening (ProfScreen)

This intervention is designed to help health professionals to identify adolescents at-risk for suicidal behaviours and psychopathology. Based on psychometric scales administered to adolescents at baseline, professionals are able to identify ‘at-risk’ pupils, by assessing their scores on the questionnaire. Pupils who screen at or above specific cut-off points are referred for professional clinical assessment where they are either identified as a false positive or referred to the local healthcare system [22].

Control

A control group was used to compare with the other three interventions. It comprised a minimal intervention that included posters in the classrooms of the six themes of the YAM intervention. Contact information for healthcare services and healthy lifestyle groups were provided.

Suicide behaviours can be prevented

A total of 168 schools were randomly assigned to the respective interventions: QPR: 40 schools (2,692 pupils); YAM: 45 schools (2,721 pupils); ProfScreen: 43 schools (2,764 pupils); and Control: 40 schools (2,933 pupils). The overall response rate of schools was 67.8% and the SEYLE sample was reasonably representative of their respective national population. Participation rates of pupils at 3 – and 12-month follow ups were 87.3% and 79.4%, respectively. All scales utilized in the study had good to very good internal reliability, as measured by Cronbach’s alpha. These include the (1) Beck Depression Inventory – II: $\alpha = 0.864$; (2) Zung Self-Rating Anxiety Scale: $\alpha = 0.805$; (3) Strengths and Difficulties Questionnaire: $\alpha = 0.740$; and (4) WHO-Five Well-Being Index: $\alpha = 0.799$ [23].

The main outcomes of SEYLE interventions included incident (new) cases of suicide attempt, severe suicidal ideation and moderate to severe depression. In the QPR intervention, there was no significant effect on incident cases for suicide

attempts, suicidal ideation or moderate to severe depression. In the Professional screening intervention, there was also no significant effect on incident cases of the outcome measures.

The ProfScreen intervention did detect 12.5% of pupils that required referral to a mental healthcare facility. Moreover, good effects were found for the treatment of identified and referred to treatment prevalent cases of depression. There is good evidence that treatment with antidepressants, lithium, neuroleptics [24], psychosocial measures like CBT and DBT are effective in the healthcare practice [25].

In the YAM intervention, more than a 50% reduction of incident cases for suicide attempts (OR: 0.45 [0.24–0.85]; $p = 0.014$) was observed. Incident cases of severe suicidal ideation and plans also significantly decreased by 50% (OR: 0.50 [0.27–0.92]; $p = 0.025$), and incident cases of moderate to severe depression significantly decreased by 30% (OR: 0.71 [0.52–0.97]; $p = 0.031$). The observed reduction in incident suicide attempts is higher than those seen in other successful universal public health interventions regarding, in particular, bullying and bully victimisation (17–23%) and certain types of school-based interventions addressing smoking cessation (14%) [2].

In qualitative interviews with instructors who led the YAM intervention in Italy, Spain, Estonia and Romania, suggestions concerning the positive experiences of the YAM intervention were conveyed, as well as suggestions for the implementation process [21].

Ethics

Results of a Delphi study in SEYLE showed that research with minors, especially for preventive purposes, investigating risk behaviours such as deviance, drug abuse, or suicidal behaviour, is ethically sensitive. The major ethical issue was the identification of emergency cases.

A specific procedure to evaluate and immediately assist emergency cases was compulsory for all pupil participation in the SEYLE interventions. Emergency cases were identified by means of two specific questions posed in the baseline questionnaire. Pupils were considered emergency cases if they responded ‘sometimes’, ‘often’, ‘very often’ or ‘always’ to the question ‘During the past two weeks, have you reached the point where you seriously considered taking your life or perhaps made plans how you would go about doing it?’; and/or if they responded ‘Yes’ to the question ‘Have you tried to take your own life during the past 2 weeks?’. Up to one percent of pupils identified in the baseline questionnaire as emergency cases were immediately referred for clinical evaluation and directed to healthcare services for treatment if necessary. However, once evaluated, and even when subjected to treatment, pupils are permitted to continue in the SEYLE interventions.

Other ethical needs considered relevant for Mental Health Research with minors were the following: confidentiality of sensitive data in relation to school; secrecy in handling the information about family members; feedback about research findings – how, when and to whom; and the importance of presenting research findings, not only unanimously, but also to give feedback to other researchers and schools involved [26].

Cost effectiveness

Incremental cost-effectiveness ratios (ICERs) analysis of SEYLE interventions in comparison with the control group showed that the YAM has the lowest incremental cost per QALY vs. Control.

ICERs for the YAM are €15,992 per QALY gained for suicide attempt. The YAM was cheapest in comparison to other interventions versus control [27].

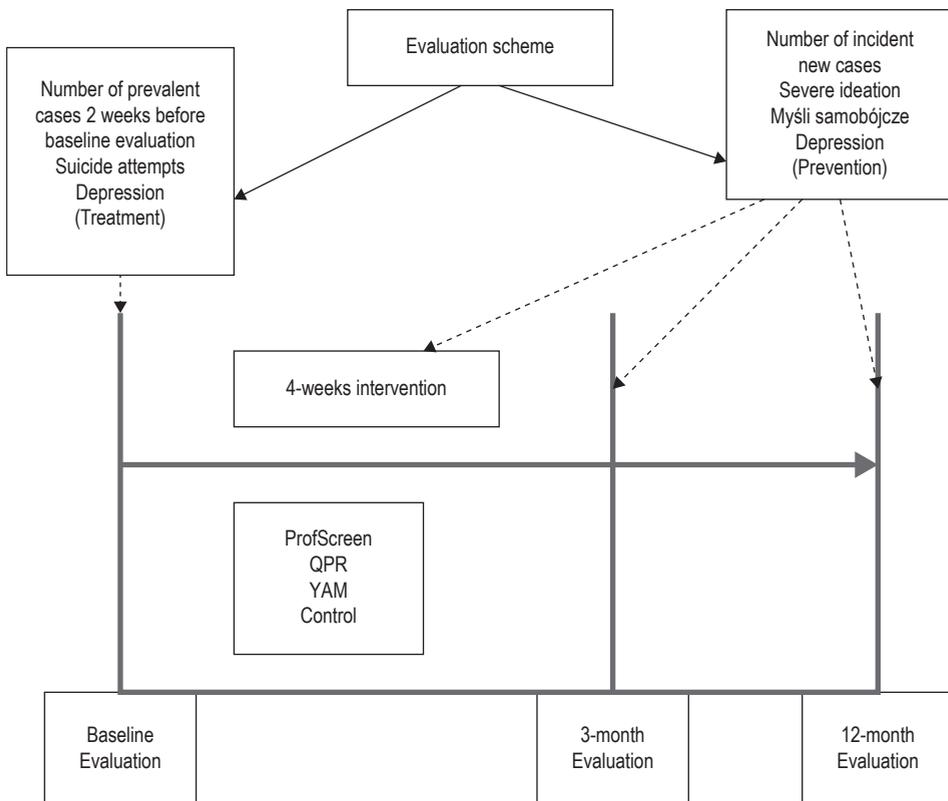


Figure 2. YAM intervention evaluation scheme

Prevention starts at conception

In our previous studies, the teenage motherhood increased the risk of both suicide attempts and completion in adolescents and young adults [28]. It is well known that suicidality is linked to psychiatric disorders. However, several epidemiological studies show that the familial transmission of suicidal behaviours is independent of the transmission of mental illness [29]. The path leading to suicidal behaviour is clearly a complex one, involving interactions between the subject's biology and environmental influences throughout life. In my group's genetic studies, Genetic Investigation of Suicide attempt and Suicide (GISS), we investigated using bioinformatics tools, the neurobiology of suicidal behaviours as one meta-system by adopting a unifying approach of 212 candidate genes indicated in suicide behaviours that represent different neuro-systems and functions as part of the same meta-system [30].

Results of our other studies clearly showed that the risk for suicidal behaviour (SB) is not only elevated in schizophrenia (SCZ), bipolar disorder (BPD) and major depressive disorder (MDD), but it also occurs in subjects without psychiatric diagnosis [31]. By using polygenic risk score (PRS) calculations, we could show that the polygenic association of SNPs in 750 neurodevelopmental genes was driven by the SA phenotype, rather than the major psychiatric diagnoses. Those findings focusing on the role of neurodevelopmental genes clearly indicate that focus of suicide prevention should shift to the period of conception, and by that, indicated preventive work with young people who will be parents is very important.

Conclusions

The observed reduction of incident suicide attempts in the YAM (Youth Aware of Mental Health) intervention is higher than in other successful universal public health interventions regarding, in particular, bullying and bully victimisation (17–23%) and certain types of school-based interventions addressing smoking cessation (14%). As illustrated by the results of the YAM intervention, suicidal behaviours can be prevented. Continuous monitoring and implementation of preventive interventions that are scientifically-based on proven preventive strategies, as the YAM programme, are greatly necessitated. These efforts need to target adolescents, as the consolidation of both health and risk-behaviours takes place during this period in life.

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