International Journal of Epidemiology, 2015, 76–76n
doi: 10.1093/ije/dyu225
Advance Access Publication Date: 26 November 2014
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Cohort Profile Update: The TRacking Adolescents' Individual Lives Survey (TRAILS)

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Accepted 4 November 2014

Abstract

TRAILS consists of a population cohort (N = 2230) and a clinical cohort (N = 543), both of which were followed from about age 11 years onwards. To date, the population cohort has been assessed five times over a period of 11 years, with retention rates ranging between 80% and 96%. The clinical cohort has been assessed four times over a period of 8 years, with retention rates ranging between 77% and 85%. Since the *IJE* published a cohort profile on the TRAILS in 2008, the participants have matured from adolescents into young adults. The focus shifted from parents and school to entry into the labour market and family formation, including offspring. Furthermore, psychiatric diagnostic interviews were administered, the database was linked to a Psychiatric Case Registry, and the availability of genome-wide SNP variations opened the door to genome-wide association studies regarding a wide range of (endo)phenotypes. With some delay, TRAILS data are available to researchers outside the TRAILS consortium without costs; access can be obtained by submitting a publication proposal (see www.trails.nl).

Key words: Cohort studies; mental disorders; health services; family; employment; genetic databases

Key Messages

- Since the publication of its cohort profile in 2008, the TRacking Adolescents' Individual Lives Survey (TRAILS) has extended its focus and data collection.
- The database was enriched with two additional data waves and several new measures, among them psychiatric diagnoses and genomewide SNP variations.
- TRAILS now covers the whole period from childhood into young adulthood, and will start collecting offspring data in the near future.
- For more information see www.trails.nl.

What is the rationale for the new data collection and focus?

As described in the original cohort profile,[1] the overall objective of TRAILS is 'to contribute to the understanding of the determinants of adolescents' mental (ill-)health and social development during adolescence and young adulthood, as well as the mechanisms underlying the associations between determinants and outcomes'. This aim still leads in all TRAILS-related activities and investments. The changes described in this update mainly refer to the enrichment of the database with two new data collection waves covering a different life phase; and additional variables such as psychiatric diagnoses, registry-recorded care utilization and genome-wide SNP variations.

TRAILS has followed (pre-) adolescents from about age 11 years onwards. At the time the original cohort profile[1] was written, the population cohort of TRAILS were about 16 years old; by now they have entered adulthood. Likewise, the age of the clinical cohort of TRAILS changed from about age 13 to about age 19. The incidence of psychiatric disorders is high in late adolescence and early adulthood, which indicated diagnostic interviews to assess psychiatric disorders and their age at onset, as well as detailed, registry-recorded data on psychiatric care utilization. Furthermore, developmental challenges change over time, which affects the factors and measures that are most relevant at a particular age. Biologically, the cohorts have matured from pre-adolescents into adults; regarding social factors, the focus in TRAILS has gradually shifted from parents and school to entry into the labour market and family formation. A final reason for the (partly) new data collection was the huge increase in genome-wide association studies and other collaborative gene-finding efforts, for which TRAILS' excellent phenotypic data have great potential value.

What will be the new areas of research?

The new areas of research can be summarized into five categories:

- family formation;
- intergenerational transmission of risk and resilience factors;
- entry into the labour market;
- psychiatric disorders and care utilization;
- detection of genes associated with health-related traits.

Family formation

Late adolescence and young adulthood are highly salient life phases with regard to partner choice and family formation. Consequently, recent data collection waves of TRAILS have included not only parent- and peer-related factors but also information about romantic relationships, and romantic partners were added to the study as informants.

Intergenerational transmission of risk and resilience factors

We will keep track of pregnancies of TRAILS participants or their partners for the upcoming 10 years, in order to assess parental and offspring (mental) health and functioning during pregnancy as well as offspring's early childhood. This information will allow examination of how the social context modifies associations between parental and offspring characteristics, and implies an extension of the study's focus with transgenerational mechanisms.

Entry into the labour market

Healthy and sustained labour market participation is essential for both individuals and the society as a whole. TRAILS offers unique opportunities to identify pathways by which early-life factors affect successful transitions into and participation in the labour market. In order to effectuate this potential, the new data collection waves have included extensive information on, among other things, (expected) educational attainment,[2] employment status, job characteristics, perceived work stress and career ambitions and opportunities.

Psychiatric disorders and care utilization

In late adolescence, 22% of the TRAILS participants had experienced an episode of severe DSM-IV mental disorder, and an additional 23% had experienced mild disorders. The burden of mental illness concentrated in the 10% of

the cohort who had three or more disorders.[3] The substantial proportion of adolescents with (serious) mental health problems raises the question whether these problems are treated adequately. The use of youth mental health care services has risen substantially during the past decades, in The Netherlands[4] as well as in other countries.[5,6]Although this rise suggests a lowered threshold for help-seeking in adolescents, only a quarter to half of those diagnosed with a psychiatric disorder actually receive help.[7] We recently linked care utilization data from a psychiatric case registry to the TRAILS database. Compared with self-reported care utilization, registry-based data have the benefit of not being affected by recall bias. The longitudinal population-based nature of TRAILS combined with detailed information about their patterns of care use will help to better understand pathways leading to or away from mental health care utilization, as well as the implications of mental health care use for future mental health.

Detection of genes associated with health-related traits

The detection of gene variants involved in individual differences in health and functioning requires very large samples to allow for adequate correcting for multiple testing and replication. TRAILS' extensive, high-quality collection of (endo)phenotypes combined with the availability of genome-wide SNP variations has made the study an attractive partner for genome-wide association studies (GWAS) regarding a wide range of (endo)phenotypes including: anthropomorphic traits;[8,9] menarche;[10] blood pressure;[11,12] and biomarkers like cortisol, insulin, glucose and lipids.[13,14] Ongoing GWAS projects concern, for instance, heart rate variability, well-being, aggression, attention deficit / hyperactivity disorder and cannabis use.

Who is in the cohort?

Population cohort

The population cohort includes participants born between 1 October 1989 and 30 September 1991, who lived in the North of The Netherlands at the time of the baseline assessment in 2001/02. The initial response rate was 76%, the mean age at that time 11.1 (SD = 0.6 years) and 51% were girls. An extensive description of the sample selection procedure can be found in the original cohort profile.[1] Subsequent data collection waves took place bi- or triennially, and all had good retention rates (see Table 1). Compared with adolescents who participated at all five data collection waves (71% of the original cohort), those who missed one or more follow-up waves were more likely to be male (56% vs 47% $\chi^2_1 = 15.7$, $P < .001$) and to come from low-socioeconomic position families (41% vs 19% $\chi^2_1 = 114.9$, $P < .001$), and had more parent-reported externalizing problems at baseline (0.27 ± 0.23 vs 0.23 ± 0.19, t (df = 857) = 2.54, $P < .001$).

At baseline, extensive recruitment efforts were made to increase the representativeness of the cohort. These efforts were successful in that they resulted in the inclusion of more vulnerable adolescents and thus (partially) prevented a non-response bias in estimated prevalences of mental health problems.[15] Although attrition at subsequent waves was higher in this hard-to-recruit group than in easy-to-recruit participants, over 60% were retained in the sample at the fourth wave, indicating that the extensive recruitment efforts at baseline had long-lasting positive effects.[16]

Clinical cohort

The clinical cohort consists of individuals who have been referred to a child psychiatric outpatient clinic in the Northern Netherlands any time before the age of 11. Data collection in this cohort started a few years after the population cohort, in 2004, with the inclusion of 543 children (response rate 43%).[1] Boys predominated in the clinical cohort because they were overrepresented in the most prevalent diagnostic groups in the outpatient clinic (i.e. attention deficit / hyperactivity disorder, disruptive behaviour and autism-spectrum disorders). Comparable to the population cohort, follow-up data collection waves occurred at intervals of 2–3 years. At present, four waves have been completed in the clinical cohort, with satisfactory retention rates (Table 1).

Table 1. Participants in the population and clinical cohort of TRAILS across the data collection waves

Wave	Population cohort			Clinical cohort		
	N (retention rate[a])	Mean age, years (SD)	% females	N (retention rate[a])	Mean age, years (SD)	% females
1	2230	11.1 (0.6)	51%	543	11.1 (0.5)	34%
2	2149 (96%)	13.6 (0.5)	51%	462 (85%)	12.8 (0.6)	34%
3	1816 (81%)	16.3 (0.7)	52%	419 (77%)	15.9 (0.7)	34%
4	1881 (84%)	19.1 (0.6)	52%	422 (78%)	19.1 (0.7)	34%
5	1778 (80%)	22.3 (0.6)	53%			

[a]Retention rate refers to the proportion of the baseline sample participating in each subsequent wave.

As in the population cohort, attrition in the clinical cohort was not completely random. Those who missed one or more follow-up waves (34% of the original cohort) were more likely to be come from low-socioeconomic position families (33% vs 21% $\chi^2_1 = 10.3$, $P = .002$). Furthermore, they had more parent-reported externalizing problems (0.50 ± 0.29 vs 0.44 ± 0.27, t ($df = 532$) $= 2.62$, $P = .01$) and fewer self-reported internalizing problems (0.35 ± 0.24 vs 0.43 ± 0.24, t ($df = 532$) $= -3.49$, $P < .001$) at baseline.[16]

What has been measured?

Table 2 provides an overview of the measures included at the data collection waves conducted so far. This overview illustrates a number of key features of the study. First, its scope is highly multidisciplinary. The outcome measures encompass both mental and physical health conditions as well as various indicators of social functioning, and the determinants encompass a wide range of biological, psychological, and social markers. Second, the information is collected from multiple sources; in addition to self- and parent-reports the database contains teacher-reported data, peer nominations, partner-reports and registry-based data from preventive child healthcare and mental healthcare providers. Third, the TRAILS cohorts have been followed from pre-adolescence into adulthood. Adolescence is characterized by major psychobiological and social transitions, which requires continuous adaptation of measures and informants in order to keep them age-appropriate and relevant.

In addition to the measures presented in Table 2, the database will be enriched with information on offspring of the TRAILS cohort. Starting in January 2015, we will monitor TRAILS participants and their partners during any pregnancy, and measure offspring development at 3, 24 and 48 months. Regarding offspring development, the focus will be on temperament, social competence, neurodevelopment and early signs of psychopathology. Social factors will include parental investment, parent-child interactions, socioeconomic position, family structure, life events and difficulties, and social support.

The TRAILS database was linked to files of the Preventive Child Healthcare services to obtain information on pre- and perinatal factors such as maternal smoking during pregnancy, birthweight and early childhood behavioural features.[17] In addition, the database was recently linked to the Psychiatric Case Registry North Netherlands (PCRNN), which registers mental healthcare use since 2000. The register includes specialist treatment in child, adolescent and adult mental health, and substance abuse service organizations. The PCRNN registers the number of 'care events', subdivided into outpatient contacts, part-time treatment days and clinical care days (24 h). We aim to realize a linkage to general practitioner information systems within 3 years.

What has it found?

Key findings and publications

At the time the original cohort profile was written, about 35 articles and book chapters had been published or accepted for publication. By now, this number has grown to over 200. An overview of these publications can be found on the TRAILS website (www.trails.nl).The number of publications and width of the topics under study preclude a comprehensive overview of the key findings here, but a selection of findings on topics that may be of particular interest to the readers of this journal (i.e., overweight, functional somatic symptoms, depression, and service use) are listed below. A review of findings on (dis-) continuity, risk and resilience factors of common mental health problems can be found elsewhere.[18]

Overweight. Relatively large increases in weight between the ages of 2 and 7 years were associated with adolescent overweight and metabolic profile, particularly in adolescents whose mothers smoked during pregnancy.[19] Childhood fatness, and increases therein during adolescence, predicted adolescent cardiometabolic risk and insulin resistance. In boys, physical fitness appeared to protect against the detrimental effects of fatness.[20] Overall and abdominal adiposity was associated with common variation in the FTO gene; overweight was additionally related to variation near the MC4R gene.[21]

Functional somatic symptoms. A series of studies regarding functional somatic symptoms, that is, symptoms that cannot be completely explained by underlying pathology, suggested that these symptoms are: triggered by a sedentary lifestyle (partly) independent of poor physical fitness;[22] associated with cortisol stress responses and pubertal status in a symptom-specific way;[23,24] more likely to occur in offspring of overprotective parents;[25] and perpetuated by school absenteeism.[26]

Depression. Consistent with prior studies in other cohorts, we found that the prevalence of depressive symptoms and disorders increased during adolescence,[3] particularly in girls.[27,28] Closer inspection revealed that this increase was related to a rise in depressed mood rather than anhedonia.[29] The assumed stress-related nature of depression was supported by prospective associations between stressful life

Table 2. Overview of measures collected in TRAILS

Variable	Instrument	Type[a]	Wave and informant[b]				
			1	2	3	4	5
Sociodemographic variables							
Sociodemographic data	Gender, age, ethnicity, living conditions, educational/work status.	Q	P	PT	A	A	A
Mental health							
Internalizing and externalizing problems	Child Behaviour Checklist (CBCL).[42] Anxious/depressed, withdrawn/depressed, aggressive, and delinquent behaviour; somatic complaints; social, thought, and attention problems during the past 6 months, as well as DSM-IV oriented scales.	Q	P	P	P		
	Adult Behaviour Checklist (ABCL).[43] See CBCL.	Q					P
	Youth Self-Report (YSR).[42] See CBCL.	Q	A	A	A		
	Adult Self-Report (ASR).[43] See CBCL.	Q				A	A
	Teacher Checklist of Psychopathology.[c] Vignettes describing CBCL/YSR dimensions.	Q	T	T	T		
Psychiatric diagnoses (DSM-IV)	World Mental Health Composite International Diagnostic Interview (CIDI).[41] Sections Depression, Mania, Panic Disorder, Specific Phobia, Social Phobia, Agoraphobia, Generalized Anxiety Disorder, Suicidality, Alcohol Use, Illegal Substance Use, Eating Disorders, Obsessive Compulsive Disorder, Gambling, Neurasthenia, Attention Deficit Disorder, Oppositional Defiant Disorder, Conduct Disorder, Separation Anxiety.	I				A	
Anxiety and depression	Revised Child Anxiety and Depression Scale (RCADS).[44] DSM-IV related anxious and depressive states (depression not at wave 3).	Q	A	A	A		
	Generalized Anxiety Scale (GAD-7).[45]	Q					A
	Beck Anxiety Inventory (BAI).[46]	Q					A
	Positive and Negative Affect Scale (PANAS).[47]	Q					A
Antisocial behaviour	Antisocial Behaviour Questionnaire (ASBQ).[c, cf. 48]	Q	A	A	A	A	A
Relational aggression	Relational aggression questions.[c]	Q		T			
Substance use	Reported substance use.[c, cf. 49] Including nicotine, alcohol, cannabis and other drugs.	Q		A	A	A	A
	Drinking Motive Questionnaire Revised (DMQ-R).[50] Motivations for alcohol use.	Q				A	
	Alcohol Use Disorders Identification Test (AUDIT).[51]	Q					A
	Cannabis Use Problems Identification Test (CUPIT).[52]	Q					A
Eating disorders	Eating Disorder Diagnostic Scale (EDDS).[53]	Q					A
Psychotic symptoms	Community Assessment of Psychic Experiences (CAPE), short form.[54] Three dimensions of psychosis: positive, negative, and depressive symptoms.	Q			A		
Social-behaviour problems	Children's Social Behaviour Questionnaire (VISK).[55] Problems in tuning of emotion/behaviour to the situation, social contacts, social orientation and social cognition; stereotypical movements and reactions to sensory information; fear of change.	Q	P	P	P	P	
Happiness	Ratings of happiness and satisfaction.[c]	Q				A	A
Physical health							
Common health problems	Developmental history interview.[c] Accidents and common disorders.	I	P				
	General health ratings.[c]	Q	APT	APT	APT	P	A
	Health questionnaire.[c] Common complaints and disorders, accidents.	Q	AP	AP	AP		
	Asthma questions.[c]	Q	P		A	A	A

(Continued)

Table 2. Continued

Variable	Instrument	Type[a]	Wave and informant[b]				
			1	2	3	4	5
	Fibromyalgia, chronic fatigue syndrome, irritable bowel syndrome questions.[c]	Q					A
Pain	Pain questionnaire.[c] Headache, back pain, etc.	Q		A	A	A	A
Impairment, medication and health service utilization							
Impairment	Columbia Impairment Scale (CIS).[56] General impairment in different domains of daily life.	Q	P	P			
	Absence from school or work.[c]	Q	T	P	P	A	A
	Use of glasses, braces, hearing aids.[c]	Q		P	P		
Health worries	Whitely Index.[57]	Q				A	
Health services utilization	Care utilization questions.[c] Various somatic and mental health services.	Q	P	P	P	P	A
	Registry-recorded care utilization 2000-now. Psychiatric Case Registry North Netherlands.	R	-	-	-	-	-
Need for care	Columbia Impairment Scale (CIS).[56]	Q	P	P			
	Need for care questions.[c]	Q			P		
Medication use	Varying questions.[c]	Q	P	P	AP	AP	A
Physical condition and development							
Morphology	Length, weight.	P	A	A	A	A	A
	Waist and hip circumference.	P			A	A	A
	Subcapular skinfolds.	P	A		A	A	
	Bio-electrical impedance. Fat percentage.	P			A		
Physical fitness	Shuttle run test.[58]	T			A		
	Peak flow test.	T			A		
Pubertal stage	Schematic drawings of pubertal development.[59]	Q	P	P			
	Pubertal development scale.[60]			A	A		
Biography							
Developmental history	Developmental history interview.[c] Perinatal circumstances and complications, timing of developmental stages, toilet-trainedness, daycare use.	I	P				
Early childhood behaviour	Preschool behaviour list.[c] Anxiety, aggression, concentration, social skills and motor skills.	I	P				
	Registry-based pregnancy and early-childhood factors.[17] Retrieved from files of the						
	Preventive Child Healthcare services.	R	-	-	-	-	-
Life events and difficulties	Developmental history interview.[c] Hospital admissions, moves to other houses, parental illness, death of dear one, parental divorce, long stay away from home age 0–11.	I	P				
	Life events questionnaire.[c] Life events in past 2 years.	Q		A	A	A	A
	Event history calendar.[c,cf.61,62] Life events in past 5 years.	I			A		A
	Life Stress Interview (LSI).[cf.63] Interviewer-rated life events between wave 3 and wave 4.	I				A	
	Turning points questionnaire.[c]	Q					
	Long-term difficulties questionnaire.[c]	Q		P		P	
	Traumatic childhood events.[c] Abuse and violence before the age of 16.	Q				A	
	Perceived stress ratings.[c] Pertaining to ages 0–5, 6–11, 11–13 and 13–16 years.	Q		AP			
Genetic factors							
Genetic risk	DNA. From blood samples. Genome-wide SNP variations and selected length polymorphisms.	P			A		
	Parental DNA. From buccal swabs. Not genotyped yet.	P			P		
Epigenetic methylation	Methylation of NR3C1, SLC6A4, COMT.	P			A		

(Continued)

Table 2. Continued

Variable	Instrument	Type[a]	Wave and informant[b]				
			1	2	3	4	5
Temperament, personality, self-perception							
Temperament	Early Adolescent Temperament Questionnaire - Revised (EATQ-R).[64,65] Fearfulness, frustration, shyness, surgency, affiliation, effortful control. At waves 4 and 5, selection of (age-appropriate) items.	Q	P	A	P	P	P
	EATQ self-report version.[64] Also including perceptual sensitivity and low-intensity pleasure.	Q	A				
	Adult Temperament Questionnaire (ATQ).[66] Only attention control items.	Q		A			
	Temperament profiles list.[c] Ratings of 9 temperament traits descriptions.	Q		T			
Personality	NEO-PI-R.[67] Facets hostility, impulsivity, assertiveness, excitement seeking, self-discipline and vulnerability to stress.	Q			A		A
	NEO-PI-R.[67] Also including self-consciousness, gregariousness, competence, deliberation, achievement striving, altruism, tendermindedness, and actions.	Q			P		
	NEO-PI-R.[67] Neuroticism.						A
Approach/avoidance	BIS/BAS Questionnaire.[68] Scales behavioural inhibition (BIS), behavioural activation (BAS) drive, BAS fun seeking and BAS reward responsiveness.	Q		A			
	Spatial Orienting Task (SOT).[69,70] Fear- and appetitive attentional processes.	T			A[d]		
	Bangor Gambling Task.[71] Emotion-based learning.	T			A[d]	A[e]	
	Approach-Avoidance Test (AAT).[72]	T					
Self-esteem	Self-Perception Profile for Children.[73,74] Scales learning, friends, sports, appearance, behaviour and general self-competence.	Q	A				
	Fear of Negative Social Evaluation scale.[cf. 75]					A	
Self-efficacy	Generalized Self-Efficacy (GSE).[76] Subset of 5 out of 10.	Q				A	
Body perception	Body perception questionnaire.[c] Perceived body size and body satisfaction.	Q				A	A
Cognitive functioning and academic performance							
Intelligence	Wechsler Intelligence Scale for Children (WISC).[77,78] Block design and vocabulary.	T	A				
	Wechsler Adult Intelligence Scale (WAIS-III).[79] Block design, vocabulary, and digit span.	T				A[e]	
Information processing capacity and social cognition	Amsterdam Neuropsychological Tasks (ANT).[80] Focused attention, sustained attention, shifting attention, memory search, face recognition, identification of facial expressions. At wave 4 without face recognition and identification of facial expressions.	T	A			A[e]	
	Rey's Verbal Learning Test.[81]	T				A[e]	
	Rey-Osterrieth Complex Figure test.[82]	T				A[e]	
	Fluency test.[83]	T				A[e]	
	Self-Ordered Pointing Task (SOPT).[84]	T				A[e]	
Cognitive style	Adolescent Cognitive Style Questionnaire (ACSQ).[cf. 85]	Q				A	
School performance	School records. Regarding language, arithmetic, sports and creative skills, as well as need for additional help due to learning difficulties.	Q	T[e]	T[e]	T[e]		
	Educational status.[c] Level of ongoing and completed education.	QI			A	A	A

(Continued)

Table 2. Continued

Variable	Instrument	Type[a]	Wave and informant[b]				
			1	2	3	4	5
Social behaviour							
Social skills	Social Skills Rating System.[86] Cooperation, assertion, and self-control.	Q	PT				
Social behaviour	Revised Class Play.[87] Sociability/leadership, aggressive/disruptive, isolated/sensitive.	Q	T[e]				
Prosocial behaviour	Prosocial behaviour questionnaire.[cf.88]	Q	T	T	T		
Relational aggression	Relational aggression questionnaire.[c] Scales perpetrations and victimization.	Q		T			
Lifestyle							
Health behaviours	Life style questions.[c] Sports, diet, etc.	Q			A	A	A
	Time spending patterns (TSP).[cf. 89]	Q	A	A	A	A	
	Physical activity and sports.[c]	I					A
Sports motivation	Achievement Goals and Beliefs about Success in Sport.[90]	Q			A		
Physiological functioning							
Autonomic nervous function	Heart rate (HR), HR variability, blood pressure(BP), baroreflex sensitivity (BRS). Supine and standing.	P	A		A[d]		
Hypothalamic-pituitary-adrenal (HPA)-axis	Salivary cortisol levels after waking up, half an hour later and at 8 pm (only wave 1).[91]	P	A		A[d]		
Psychophysiological stress-reactivity	Laboratory experiments. Physiological and subjective (re)activity assessed in a number of experimental conditions. Experimental conditions included orthostatic stress (from supine to standing), a startle reflex task[92] and the Trier Social Stress Test.[93] Physiological measures concerned HR, BP, BRS, pre-ejection period (PEP), respiratory sinus arrhythmia (RSA), eyeblink reflexes (only at startle reflex task) and salivary cortisol (only at the Trier test). Self-reported stress was assessed by the Self-Assessment Manikin,[94] the Profiles of Moods Schedule (POMS),[95] and the State-Trait Anxiety Inventory (STAI).[96]	PT			A[d]		
Biological markers	CRP, creatinine, ASAT, ALAT, cholesterol (HDL, LDL), glucose, insulin, lipoprotein, HbA1c, platelet serotonin, platelet tryptophan, IgE, IgG antibodies [HSV 1 & 2, EBV, human herpesvirus 6, toxoplasma gondii, influenza (A, B), gliadin, cytomegalovirus, ACTH, alpha-MSH], apoliprotein (A1, B100). Assessed in blood samples.	P			A		
Family characteristics							
Family composition	Developmental history interview.[c]	I	P				
Socioeconomic position	Parental socioeconomic position. Based on education, profession and income.	IQ	P			P	
Home environment	Observed home environment.[c] Atmosphere, dirt, luxury, space.	O	I				
Familial psychopathology and distress	Vignettes[c] describing depression, anxiety, addiction, antisocial behaviour, psychoses, ADHD and PDD-NOS of biological parents and sibling.	IQ	P		PS		
	Depression Anxiety Stress Scales (DASS).[97] Depression, anxiety, and stress.	Q	P				
	Kessler Psychological distress Scale (K10).[98]	Q				P	
Chronic conditions of family members	Developmental history interview.[c] Handicaps, chronic diseases, mental health problems.	Q	P				
	Long-term difficulties questionnaire.[c]	Q		P	P	P	
Parental happiness	Ratings of happiness and satisfaction.[c]	Q				P	P
Familial personality	NEO-PI-R.[67] Facets vulnerability to stress, hostility, impulsivity, self-consciousness, assertiveness, excitement seeking, gregariousness, competence, self-discipline, deliberation, achievement striving, altruism, tendermindedness, and actions.	Q			PS		

(Continued)

Table 2. Continued

Variable	Instrument	Type[a]	Wave and informant[b]				
			1	2	3	4	5
Parental health and health behaviours	General health.[c]	Q	P	P	P	P	
	Physical activity.[c]	Q	P	P	P		
	Substance use.[c]	Q	P	P	P		P
Parental health worries	Whitely Index.[57]					P	
Parental religiosity	Developmental history interview.[c]	I	P				
	Religion and religiosity.[c, cf. 99]	Q				P	
Family functioning							
General family functioning	Family Assessment Device.[100,101]	Q	P	P	P	P	P
Parenting stress	Parenting Stress Index (PSI).[102,103]. Parental distress and difficult child characteristics.	Q	P		P		
Parental rearing behaviours	EMBU-C (Egna Minnen Betraffande Uppfostran).[104] Scales overprotection, emotional warmth, and rejection. The T4 list contains only the 8 most relevant items.	Q	A			A	
Parental monitoring	Parental knowledge questions[c] regarding friends, time spending and drug use.	Q		A			
	Parent-child relation questions[c, cf. 105] regarding child disclosure, parental solicitation, parental control and parental reactions to disclosure.	Q			A		
Conflicts	Conflicts Tactics Scale (CTS-PC and CTS-CP).[cf. 106] Corporal punishment and psychological aggression, both from and toward parents.	Q					P
Peer and romantic relationships							
Peer status	Peer nominations.[c,32,107] Liking, disliking, helping and bullying; additional items at wave 2.	Q	C[e]	C[e]			
Friends	Number and quality of friendships.[c]	I			A		A
Romantic relationships	Current and past relationships.[c]	QI			A	A	A
Relationship satisfaction	Investment Model Scale.[108] Satisfaction, alternatives, investment, commitment	Q				A	A
Intrasexual competion	Intrasexual Competition Scale.[109]	Q				A	
Sexuality	Age at first sexual intercourse.	Q		A	A	A	A
	Sexual experiences and pregnancy.[c]	Q				A	A
Partner characteristics	Sociodemographic information, health, smoking, alcohol use,[50] drugs use, personality (see Familial personality),[67] psychopathology (see Familial psychopathology), past relationships. Sexual behaviour, intrasexual competition,[109]relationship satisfaction.[108]	Q					R
Partner support	Experienced partner support.[c]	Q					AR
Inter-partner aggression	Conflict in Adolescent Dating Relationships Inventory.[110]	Q					R
Work-related factors							
Jobs	Paid jobs.[c] Start and end date, number of hours per week, type of work.	IQ			A	A	A
Job characteristics	Social support, social relations, sense of commitment.[c]	Q					A
	Copenhagen Psychosocial Questionnaire – short version.[111]	Q					A
Work engagement	Utrecht Work Engagement Scale (UWES).[112] Selection of 3 items.	Q					A
Absence	Absence from work.[c]	Q				A	A
Ambitions	Professional ambitions and expectations[c] from self and parents.					AP	P
Miscellaneous							
Sleep	Nottingham Health Profile (NHP).[113] Sleep scale.	Q				A	A

(Continued)

Table 2. Continued

Variable	Instrument	Type[a]	Wave and informant[b]				
			1	2	3	4	5
Time spending	Time Spending Patterns.[cf. 89]	Q	A	A	A	A	
Sources of well-being	Social Production Functions (SPF) Questionnaire.[cf. 114] Affection, behavioural confirmation, status, stimulation, and comfort from parents, teachers and peers.	Q	A	A	A		
Motives for behaviour	Motives for behaviour questionnaire.[c] Hedonic, instrumental and normative motives.	Q		T	T		
Religion and religiosity	Developmental history interview.[c]	I	P				
	Religion and religiosity.[c, cf. 99]	Q				P	
Discrimination	Discrimination questions[c] regarding race, gender or physical appearance.	Q		A			
Noise	Disturbance by noise.[c] Disturbance experienced from different sources of noise.	Q			A		
Debts	Financial debts.	Q					A

Information that will be collected from the offspring of the TRAILS cohort (starting January 2015) is not included in this overview.

[a]Q, questionnaire; I, interview; P, physical examination (anthropomorphic measures; physiological measures; biomarkers); T, neuropsychological or behavioural test; R, registry-based; O, observation.

[b]A, adolescent; P, parent; T, teacher; C, classmates; R, romantic partner; S, sibling; I, interviewer.

[c]Developed by TRAILS or composed from other instruments.

[d]Assessed in a high-risk subsample.

[e]Only assessed in the population cohort.

events and depressive symptoms,[30,31] but appeared to be complex. Among other things, the stress-depression relation was modified by gender,[30,32] temperament,[33] exposure to childhood adversities,[34] attentional style[35] and emotion recognition skills.[36] How depression related to physiological stress-reactivity depended on the nature[37] and duration[38] of the symptoms.

Service use. High maternal education predicted mental health service use independent of the severity of the mental health problems.[39] A comparison of the course of emotional and behavioural problems in adolescents with and without mental health service use by means of propensity score matching showed that the problem trajectories of adolescents who received care were less favourable than the problem trajectories of those who did not; which may indicate that, overall, the benefits of mental health services are questionable.[40]

Descriptive statistics for the new data collected—the prevalence of psychiatric disorders

The new data collected included a psychiatric diagnostic interview, the World Mental Health Organization Composite Diagnostic Interview (CIDI),[41] which was administered at the fourth wave. The CIDI yields psychiatric diagnoses according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). Ormel *et al*.[3] provided an extensive overview of the prevalence, severity, age of onset, continuity and comorbidity of these disorders in the population cohort. Since the publication of this article, information on psychiatric diagnoses has also become available for the clinical cohort of TRAILS (Table 3). Substantially elevated prevalence rates in the clinical cohort were found for obsessive compulsive disorder, attention deficit / hyperactivity disorder and oppositional defiant disorder, followed by other anxiety disorders and mood disorders.

What are the main strengths and weaknesses?

Main strengths

As mentioned in the original cohort profile,[1] strengths of TRAILS include its sample size, the combination of a population-based and a clinical cohort, the breadth of the risk and outcome factors assessed (Table 2), the use of multiple informants and multiple methods, and the homogeneity of the samples with regard to age. In addition to that, we can now add that we managed to maintain high retention rates, even after 10 years (Table 1), and to further enrich the database with additional measures, making it an exceptionally rich source of information. Another strength worth mentioning here concerns the quality of its data repository, which qualified for a Data Seal of Approval (see www.datasealofapproval.org) in 2014.

Table 3. Lifetime prevalences of DSM-IV psychiatric disorders in the population and clinical cohort of TRAILS, at mean age 19 years

Diagnosis	Lifetime prevalence (SE[a]) in %	
	Population cohort (N = 1584)	Clinical cohort (N = 349)
Mood disorders		
Major depressive disorder	15.5 (0.9)	20.1 (2.1)
Bipolar disorder	1.5 (0.3)	2.6 (0.9)
Dysthymia	1.7 (0.3)	2.7 (0.9)
Anxiety disorders		
Generalized anxiety disorder	2.9 (0.4)	4.3 (1.1)
Social phobia	12.4 (0.8)	21.8 (2.2)
Specific phobia	11.5 (0.8)	16.6 (2.0)
Agoraphobia (without panic)	1.0 (0.2)	0.3 (0.3)
Panic disorder	1.6 (0.3)	1.7 (0.7)
Separation anxiety disorder	3.1 (0.4)	5.7 (1.2)
Obsessive compulsive disorder	5.9 (0.6)	17.5 (2.0)
Behavioural disorders		
Attention deficit / hyperactivity disorder	4.2 (0.5)	14.0 (1.9)
Oppositional defiant disorder	8.9 (0.7)	18.6 (2.1)
Conduct disorder	8.6 (0.7)	6.9 (1.4)
Substance abuse and dependence		
Alcohol abuse	25.1 (1.1)	25.5 (2.3)
Alcohol dependence	3.2 (0.4)	4.9 (1.2)
Drug abuse	13.2 (0.9)	12.3 (1.8)
Drug dependence	4.5 (0.5)	4.0 (1.1)

In the population cohort, sampling weights were used to represent the distribution of the cohort at baseline. For more details see Ormel et al.[3]
[a]SE, standard error

Main weaknesses

Previously mentioned weaknesses of TRAILS included the relatively low number of in-depth assessments, the lack of prospective data on determinants of pathology that occurred before the baseline assessment (except for Preventive Child Healthcare files) and insufficient power regarding rare disorders or small (gene-environment) interaction effects. In addition it should be noted that, despite extensive efforts to prevent attrition, adolescents dropped out of the study selectively. Attrition was associated with being male, low socioeconomic position, peer problems, substance use and externalizing problems.[16]

Can I get hold of the data? Where can I find out more?

With some delay, TRAILS data are made available to researchers outside the TRAILS consortium. The availability of TRAILS data is communicated through DANS EASY (https/easy.dans.knaw.nl). These data are available without costs, but not freely accessible; access can be obtained by submitting a publication proposal. Providing that the proposed publication does not overlap with other TRAILS publications, permission to use the data requested is given for a period of 1 year, and automatically withdrawn if the manuscript has not been submitted for publication within that period. TRAILS data that have not yet been released for use by external researchers are subject to additional demands and costs. More information and a publication proposal form can be obtained via the website (trails@umcg.nl) or the corresponding author (A.J.O.). Please note that TRAILS adopts a publication bias prevention policy, which implies that all research questions and hypotheses specified in the publication proposal should be included in the manuscript, regardless of the significance of the findings.

Funding

TRAILS has been financially supported by grants from The Netherlands Organization for Scientific Research NWO (Medical Research Council programme grant GB-MW 940-38-011; ZonMW Brainpower grant 100-001-004; ZonMw Risk Behaviour and Dependence grant 60-60600-97-118; ZonMw Culture and Health grant 261-98-710; Social Sciences Council medium-sized investment grants GB-MaGW 480-01-006 and GB-MaGW 480-07-001; Social Sciences Council project grants GB-MaGW 452-04-314 and GB-MaGW 452-06-004; NWO large-sized investment grant 175.010.2003.005; NWO Longitudinal Survey and Panel Funding 481-08-013; NWO Vici 016.130.002; NWO Gravitation 024.001.003), the Dutch Ministry of Justice (WODC), the European Science Foundation (EuroSTRESS project FP-006), Biobanking and Biomolecular Resources Research Infrastructure BBMRI-NL (CP 32), the participating universities and the Accare Centre for Child and Adolescent Psychiatry.

Acknowledgements

This research is part of the TRacking Adolescents' Individual Lives Survey (TRAILS). Participating centres of TRAILS include various departments of the University Medical Centre and University of Groningen, the Erasmus University Medical Centre Rotterdam, the University of Utrecht, the Radboud Medical Centre Nijmegen and the Parnassia Bavo group, all in The Netherlands. We are grateful to all individuals who participated in this research, and to everyone who worked on this project and made it possible.

Conflict of interest: None declared.

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