



FAMILY

“Running in the FAMILY – Understanding and predicting the intergenerational transmission of mental illness”

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List of polygenic scores indexing direct and indirect genetic effects

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SUMMARY

This document presents a comparative analysis of genetic nurture estimates for mental health outcomes, a rapid review of recent literature in the area, and highlights current gaps in the literature and promising lines of enquiry based on emerging evidence.

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1 INTRODUCTION

1.1 Purpose and Scope

This document provides evidence of genetic nurture effects for mental health outcomes. We review findings from family-based and within-sibship genome-wide association studies (GWAS) and conduct a rapid review of the literature on genetic nurture in mental health, including findings obtained as part of FAMILY. Specifically, we extract population and direct genetic effect estimates from Tan et al. (2024) and Howe et al. (2022) to compare family-GWAS and within-sibship GWAS estimates, respectively. We present a comparative table highlighting the degree of attenuation in population genetic effects after accounting for familial effects across different mental health outcomes, ranking traits based on the strength of evidence for genetic nurture. Finally, we perform a rapid review of genetic nurture effects in mental health by adapting the search strategy from our previous article on genetic nurture for educational outcomes, Wang et al. (2021). Our updated search across multiple databases identified 141 primary studies, with 12 studies selected for further analysis. By integrating these approaches, this document provides a comprehensive overview of current evidence, methodological considerations, and key findings related to genetic nurture effects in mental health.

1.2 References to other FAMILY Documents

- FAMILY DoA
- FAMILY Deliverable 3.1

1.3 Definitions, Abbreviations and Acronyms

Table 1 List of Abbreviations and Acronyms

Abbreviation/ Acronym	DEFINITION
PGS	Polygenic scores, an individual score summarising the effects of thousands of DNA variants that contribute to individual differences on a trait. Also referred to in the genetics literature as ‘polygenic risk score’ or ‘polygenic index.’
DGE	Direct genetic effects, the process by which biological parents’ each pass on half of their genetic material to their children. Also referred to in the genetics literature as ‘genetic transmission.’
IGE	Indirect genetic effects, the process by which parents’ genes indirectly influence outcomes for their offspring through their rearing environment beyond direct genetic transmission. In genetics literature, several other terms have been used to describe this including ‘dynastic effects,’ ‘genetic nurture,’ and ‘familial genetic effects.’
GWAS	Genetic studies that examine millions of genetic variants to identify those that are associated with a trait of interest (e.g. educational attainment).

2 FINDINGS FROM FAMILY-BASED AND WITHIN-SIBSHIP GENOME-WIDE ASSOCIATION STUDIES

2.1 Background

The literature on direct and indirect genetic effects (DGE and IGE, respectively) in mental health outcomes is still scarce. However, in recent years several attempts have been made to estimate DGE and IGE in a wide range of human traits. In this chapter, we start by examining findings from Tan et al. (2024) and Howe et al. (2022), who employed family-based genome-wide association study (GWAS) designs to separate DGEs from IGEs.

Tan et al. (2024) conducted a meta-analysis of family-GWAS across multiple cohorts, estimating DGEs by controlling for parental genotypes and accounting for environmental confounding factors such as assortative mating. They compared traditional population-based GWAS estimates to those derived from family-based models. In the presence of IGEs, DGE are typically expected to be lower than population-based estimates (i.e., attenuation).

Similarly, Howe et al. (2022) applied a within-sibship GWAS approach across 19 cohorts, capitalising on genetic differences between siblings to control for shared environmental and parental genetic influences. The attenuation of genetic effect estimates in within-sibship models compared to population-based GWAS can provide evidence for IGEs, as the reduction indicates that part of the genetic signal in population-based analyses is mediated by parental influence rather than direct inheritance.

Therefore, by comparing estimates from these two different GWAS designs, we can infer the magnitude of IGE in mental health outcomes. That is, traits showing greater attenuation in within-family analyses may have a stronger contribution from genetic nurture, where parental genes shape the environment in ways that affect offspring mental health. However, each method captures different sources of genetic confounding and omits others, therefore their estimates are not directly comparable. For example, within-sibship GWAS does not control indirect genetic effects of siblings (i.e., effects of sibling genotypes on the shared environment) nor assortative mating while family-GWAS does account for assortative mating.

For more details on the use of parent-offspring trios and sibling data to estimate DGE and IGE, see FAMILY Deliverable 3.1.

2.2 Interpretation of findings

In Tables 2 and 3, we display a selection of population and direct genetic effects from Tan et al. (2024) and Howe et al. (2022), focusing on mental health related outcomes. We have ranked these outcomes based on the strength of evidence for IGEs, highlighting those with the greatest attenuation of population genetic effects.

In Tan et al. (2024), evidence for IGEs is inferred by examining the attenuation of direct genetic effects when moving from population-based GWAS to family-based GWAS. In Table 2, we provide the ‘direct effect’ (δ) of the polygenic score for 11 traits, as reported by Tan et al. (2024), which is the partial correlation with the phenotype conditional on parental polygenic scores and reflects only direct genetic effects. The population effect (β) of the polygenic scores is the partial correlation conditional on standard covariates (without accounting for parental polygenic scores) and thus reflects DGEs, IGEs, and confounding factors.

Table 2 Selected estimates from Tan et al. (2024)

TRAIT	δ (DGE)	β (POP)	β - δ (%)
Depression	0.02	0.06	66.7
Educational attainment	0.05	0.08	37.5
Neuroticism	0.03	0.04	25.0
Ever-smoker	0.07	0.09	22.2
Cigarettes per day	0.05	0.03	No attenuation
ADHD	0.04	0.03	No attenuation
Subjective well-being	0.01	0.01	No attenuation
Cognitive performance	0.05	0.05	No attenuation
Drinks per week	0.05	0.05	No attenuation
Self-rated health	0.04	0.04	No attenuation
Depressive symptoms	0.05	0.03	No attenuation
Notes: Traits are sorted from higher to lower shrinkage (β - δ). δ = direct effect of the polygenic scores; β = population effect of the polygenic scores; β - δ = observed attenuation in population-based polygenic score prediction, expressed in percentages.			

It is worth noting that several traits show DGEs estimates *higher* than their population-based counterpart. These results run counter to the intuition that family-GWAS and within-sibship GWAS DGE estimates should be deflated relative to population effects because the influence of assortative mating and IGEs, which are often assumed to be highly correlated with DGEs, is removed. The authors explain these findings due to negative correlations between DGEs and non-transmitted genetic effects due to ascertainment and selection. More information about this phenomenon can be found in the original family-GWAS publication (Tan et al., 2024) and in Young et al. (2022).

Similarly, in Howe et al. (2022), if a trait shows shrinkage (i.e., the proportion decrease from population to within-sibship estimates of genetic variant–phenotype associations) or strong attenuation (i.e., decrease in within-sibship SNP heritability estimates compared to population-based estimates), this suggests that indirect genetic effects (e.g., parental influences on the child's environment) contribute significantly to the genetic associations detected in population-based GWAS (see Table 3).

Based on the findings from Howe et al. (2022) and Tan et al. (2024), traits such as depressive symptoms, smoking-related traits, and educational attainment suggest significant genetic

nurture effects. This might support a bigger role of IGEs in socioeconomic traits than for biological traits, with mental health traits falling somewhere in between: some mental health related traits show evidence of moderate IGEs, such as depression and possibly substance use (smoking-related traits), whereas others show less sign of such effects, like ADHD.

However, even within study, different metrics (e.g., genome-wide correlation of DGEs and population effects vs attenuation of population polygenic score coefficients), show heterogeneous findings. In addition, there is limited evidence regarding most mental health outcomes and when reported, their findings are also significantly heterogeneous, highlighting the need for harmonised research efforts to estimate DGE and IGE in large samples. More notable is the absence of cross-trait IGEs, that is, the effect of the polygenic liability for one trait in the parent on a *different* trait on their offspring, as well as multi-trait IGEs. At last, both studies rely primarily on European-ancestry cohorts, limiting the ability to generalize findings to non-European populations.

Table 3 Selected estimates from Howe et al. (2022)

TRAIT	SHRINKAGE (%)	ATTEN. OF h^2_{SNP} (%)
Educational attainment	46.5	76%
Cognitive performance	21.6	44%
Ever-smoker	19.4	25%
Depressive symptoms	49.8	22%
Cigarettes per day	18.8	N/A
Subjective well-being	9	N/A
Neuroticism	1.6	N/A
Drinks per week	-3.2	N/A

Notes: Traits are sorted from higher to lower attenuation of genetic effects.
 h^2_{SNP} = SNP heritability estimated using LDSC; shrinkage = the reduction in effect sizes when moving from population-based GWAS to within-sibship GWAS under liberal threshold ($P < 1 \times 10^{-5}$); atten. = observed attenuation (i.e., reduction) in effect sizes observed when comparing traditional population-based GWAS estimates to within-sibship GWAS estimates. of h^2 .

3 EMPIRICAL EVIDENCE USING TRIO DESIGN

3.1 Background

In the rapid review on IGE on child and adolescent mental health, we adapted the search strategy from Wang et al. (2021) to identify studies that had employed polygenic score trio designs to estimate IGEs on mental health outcomes in offspring [see Appendix 1]. We systematically searched the MEDLINE, Embase, PsycInfo, and Web of Science databases on 6 March 2025. The search was conducted by Senior Librarian Trude Anine Mugerud at the Norwegian Institute of Public Health library, in collaboration with the authors of this report. The search identified 309 primary studies, of which 141 remained after duplicate removal. After screening the titles and abstracts, 23 potentially relevant studies remained. Further in-

depth screening of abstracts and full papers resulted in 12 studies eligible for inclusion (see Table 4). From each study, we extracted information about the sample, methods, and whether the results provided support for IGEs based on a 5% alpha threshold (multiple testing corrected if available).

3.2 Rapid review of the literature

In Table 4, we present the main characteristics of the studies under review, organised by their overall support for IGEs (top) or lack of support thereof (bottom). Overall, the most common methodology to detect IGEs was ‘Trio PGS’ (see FAMILY Deliverable 3.1 for an overview of this method). The most common outcomes in children were externalising behaviour, including ADHD-related traits (10 out of 12 studies). Studies which showed evidence of IGEs had larger sample sizes overall (approximately >19,000 parent-offspring trios).

Table 4 Summary of rapid review results on indirect genetic effects on child and adolescent mental health

Authors (Year)	Method	Sample	N trios	Outcome	Sig. IGE	Non-sig. IGE
Pingault et al. (2023)	Trio PGS	Pop-based (EUR)	19,506	ADHD traits	Maternal: neuroticism, cognition and EA. Paternal: alcohol use.	ADHD, schizophrenia, bipolar disorder, depression, anxiety, smoking, cannabis use.
Hegemann et al. (2025)	Trio PGS	Pop-based (EUR)	24,692	Hyperactivity	Maternal: autism, EA, cognitive ability.	ADHD, dyslexia.
				Inattention	Paternal: EA.	Cognitive ability, ADHD, dyslexia.
				Motor skills	Maternal and paternal: EA, cognitive ability.	Autism, ADHD and dyslexia.
				Language skills	None	Autism, EA, cognitive ability, ADHD and dyslexia
				Social/communication skills	Maternal: EA.	Autism, cognitive ability, ADHD, dyslexia.
				Repetitive and restrictive behaviours	Maternal: cognitive ability.	Autism, EA, ADHD, dyslexia.
Askelund et al. (2025)	Trio PGS	Pop-based (EUR)	33,351	Intercept of CBCL total problems	Maternal: autism, depression.	ADHD, anorexia, Tourette's syndrome, OCD, schizophrenia, bipolar disorder, alcohol dependence, anxiety, PTSD.
				Intercept of differentiation	None	ADHD, anorexia, Tourette's syndrome, OCD, schizophrenia, bipolar disorder, autism, depression, alcohol dependence, anxiety, PTSD.
Sally et al. (2022)	Trio PGS linear	Clinical (parents with/without alcohol dependence, European and African)	1,111	Externalising behaviours in adolescence	Externalising (EUR)	Externalising (AFR)

van der Laan et al. (2023)	T/NT PGS	Pop-based (EUR twins)	3,024	Child aggression	None	Early-life aggression, EA, ADHD.
Voronin et al. (2024)	Trio PGS and twin	Pop-based (EUR twins)	415	Hyperactivity and inattention	None	ADHD, EA.
Axelrud et al. (2023)	Trio PGS	Population (high-risk, Admixed Brazilian)	1,017	ADHD traits and psychotic symptoms	None	Cognition, EA, ADHD, schizophrenia.
Frach et al. (2024)	Trio PGS	Pop-based (EUR)	31,290	Conduct problems	None	ADHD, depression, anxiety, antisocial behaviour, lifetime smoking, problematic alcohol use, cannabis use disorder, cognitive performance, EA, household income, risky behaviours, age at first birth.
de Zeeuw et al. (2020)	T/NT PGS	Pop-based (EUR twins)	2,649	ADHD traits	None	EA, ADHD.
Nayar et al. (2021)	Trio PGS	Clinical (EUR autistic children)	2,614	Autism-related traits	None	Autism.
Birmaher et al. (2022)	Logistic/Cox regression	Clinical (parents and offspring w/wo bipolar disorder, EUR)	331	Bipolar disorder	None	Bipolar disorder.
Shakeshaft et al. (2024)	T/NT PGS	Pop-based (EUR and SAS)	3,063	Emotional disorders	None	Anxiety, major depression, broad depression, bipolar disorder, schizophrenia, ADHD, autism.
				Emotional symptoms	None	Anxiety, major depression, broad depression, bipolar disorder, schizophrenia, ADHD, autism.
Notes: AFR = African; EA = educational attainment; EUR = European; PGS = polygenic scores; Pop-based = Population-based; T/NT = transmitted / non-transmitted; SEA = Southeast Asian. * Here we report only conditional associations within the trio design.						

More in detail, the studies included in our review used similar methods but focused on a heterogeneous set of outcomes, ranging from specific psychiatric symptoms and neurodevelopmental traits measured in the general population to paediatric bipolar disorder and autism in clinical cohorts. The three studies relying on the transmitted/non-transmitted PGS design (with cohort sizes ranging between 2,649-3,063) did not identify any significant indirect genetic effects. This may be related to insufficient statistical power due to both sample sizes and limitations of this method as we reported in the first report (see FAMILY Deliverable 3.1). The same consideration likely applies to the two studies with less than 500 trios. The remaining seven studies (of which four were based on the Norwegian Mother, Father, and Child Cohort study; MoBa) were more likely to identify significant indirect genetic effects, with a few exceptions.

Among the studies that showed evidence of indirect genetic effects, parental PGSs for autism showed an indirect effect on different child outcomes, in all cases driven by the mothers (two MoBa studies). The parental educational attainment PGS showed an indirect association with ADHD traits in children in two MoBa studies. Interestingly, this association was sometimes in a positive direction of association (i.e., higher PGS for educational attainment in parents positively associated in more ADHD-related symptoms). As some authors have noted, however, these findings might be due to shared rater bias originated from using reports from only one parent (Frach et al., 2024). Finally, parental PGS for cognitive ability were positively associated with a range of neurodevelopmental traits after accounting for the child PGS. In sum, the findings that are consistent across the included studies are mainly from the same sample (MoBa). While providing triangulation of findings across different methods, the current evidence base is too limited to draw strong conclusions and requires both studying many unexplored traits and replication of previous findings in independent cohorts.

3.3 Emerging evidence

Since the initial search, a study conducted by our research team was published (Allegrini et al., 2025). This study was particularly comprehensive and provided stronger evidence of indirect genetic effects compared to previous studies. The authors found evidence consistent with maternal indirect effects of liabilities to general psychopathology, neuroticism, chronic pain, and autism on a general psychopathology factor in 8-year-old children. In addition, both mother- and father-driven indirect effects of the same liabilities were identified across different types of emotional and behavioural difficulties in childhood in 14,959 family trios in MoBa.

In addition, an unpublished multi-cohort study across 7 European cohorts (total N = 15,475) also shows some evidence of an indirect genetic effect of maternal liability to neuroticism on offspring emotional problems in early childhood, but not later in development (Sallis et al., 2024). Thus, emerging evidence which begins to expand beyond the MoBa cohort supports a role of (maternal) liability to neuroticism in indirect associations with offspring mental health. Note that Allegrini et al. (2025) also found support for IGEs of neuroticism on inattention and depression driven by both mothers and fathers.

3.4 Recommendations for future studies based on the rapid review

In summary, this review provides some degree of support for IGEs of parental polygenic scores for neuroticism, autism, educational attainment, and cognitive ability on offspring mental health. Due to the broad and unspecific nature of the educational attainment PGS, any indirect effects may be difficult to interpret, as highlighted by the differing directions of effect in the studies included here. Since many of the identified associations are driven by mothers and the offspring traits are also often mother reported (leading to possible rater bias), examining indirect genetic effects based on information from different raters (mothers, fathers, and teachers) should be a primary focus going forward. Future multi-cohort studies will also be

essential to improve statistical power and assess the replicability of the identified predictors across samples and settings.

4 LIST OF POLYGENIC SCORES INDEXING DIRECT AND INDIRECT GENETIC EFFECTS

Based on the comparison of the family-based and within-sibship GWAS as well as the rapid review of the empirical evidence to date, we provide a preliminary list of current polygenic scores that may show evidence of IGE for mental health outcomes:

- Neuroticism
- Autism
- Depression
- Cognitive ability
- Educational attainment

Note that this list is not exhaustive, and that limitations in the current evidence base precludes strong recommendations regarding which PGS should be investigated by researchers. Yet unexplored traits might play important roles. With that caveat in mind, this list can be used to prioritise which PGS to include in models attempting to predict IGEs in mental health outcomes.

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6 APPENDICES

1. Search strategy to identify trio design polygenic score studies on mental health outcomes.

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Which polygenic scores tend to show indirect effects on mental health in early life?

Contact person: Adrian Dahl Askelund
Search: Trude Anine Muggerud
Reviewer: Bente Foss
Duplicate check in Before duplicate removal: 309 primary studies, 15 systematic reviews
EndNote: After duplicate removal: 141 primary studies, 8 systematic reviews

Database: Ovid MEDLINE(R) and Epub Ahead of Print, In-Process, In-Data-Review & Other Non-Indexed Citations, Daily and Versions <1946 to March 05, 2025>
Date: 06.03.25
Numbers: 82 primary studies, 3 systematic reviews

1	Child/ or Child, Preschool/ or Pediatrics/ or Students/ or Minors/ or Adolescent/ or (child* or pediatric* or paediatric* or toddler* or preschooler? or "pre schooler?" or preadolescen* or prepubescen* or preteen? or tween? or teenager? or boy? or girl? or kid? or juvenil* or underage* or minor? or pubescen* or student* or adolescen* or teen? or teenage* or (young* adj (people or person*)) or youth*).tw,kf.	4906298
2	Genetic Risk Score/ or (((polygenic or polygenetic or genetic? or genomic or genotype or genotypic or "genome wide" or genomewide) adj scor*) or ((polygenic or polygenetic or genetic? or genomic or genotype or genotypic or "genome wide" or genomewide) adj ("risk scor*" or "risk assessment?")) or "genetic liabilit*").tw,kf.	12695
3	("nature of nurtur*" or "genetic nurtur*" or "indirect genetic*" or "virtual parent design" or "pseudo control" or "dynastic effect*" or intergeneration* or multigeneration* or ((transmit* or nontransmit*) adj allele*) or "passive gene environment correlation" or (genetic adj (inheritance or confounding*)) or ((genetic or parental or maternal or paternal or familial) adj transmission) or ((parental or maternal or paternal) adj influence?) or "social inheritance" or "social genetic effect*" or ((environmental or cultural or vertical) adj transmission) or "family based stud*" or "familybased stud*" or trio* or triad* or dual* or dyad*).tw,kf.	465245
4	Mental Disorders/ or Anxiety/ or Panic Disorders/ or Phobic Disorders/ or exp "Feeding and Eating Disorders"/ or Depression/ or Dysthymic Disorder/ or Bipolar Disorder/ or Suicide/ or Self-Injurious Behavior/ or Obsessive-Compulsive Disorder/ or Stress Disorders, Post-Traumatic/ or Adjustment Disorders/ or Conduct Disorder/ or exp Schizophrenia/ or Psychotic Disorders/ or Hallucinations/ or Paranoid Disorders/ or exp Substance-Related Disorders/ or Marijuana Abuse/ or exp Autism Spectrum Disorder/ or Attention Deficit Disorders with Hyperactivity/ or Neurodevelopmental Disorders/ or exp Tic Disorders/ or Dissociative Disorders/ or Depersonalization/ or exp Sleep Wake Disorders/ or (((Mental or psychiat* or psychological) adj (disorder? or disease? or illness* or problem?)) or "nervous breakdown?" or ("mental health" adj	2082674

Litteratursøk fra Bibliotek for helseforvaltningen

Dokumentasjon av søkestrategi

	(disorder? or disease? or illness* or problem?)) or ((psychological or emotional) adj (distress or stress or problem?)) or psychopatholog* or internali* or externali* or "conduct disorder?" or "oppositional defiant disorder?" or (eating adj2 disorder*) or anorexi* or bulimi* or "binge eating" or orthorexi* or anxiety or anxious or angst or "panic disorder?" or phobi* or agoraphobi* or ((bipolar or manic) adj (disorder? or illness)) or "mood disorder?" or "bipolar affective psychos#s" or depression or depressive or dysthymi* or GAD or suicid* or (self adj (harm* or injur* or wounding or mutilation)) or ("self inflicted" adj (harm or injur* or wound?)) or "self injurious behavio?r" or automutilation or "obsessive compulsive disorder?" or OCD or "compulsive obsessi* disorder?" or ((compulsive or obsessive) adj neurosis) or (("post traumatic" or posttraumatic) adj stress) or "acute stress disorder?" or "traumatic stress" or PTSD or "adjustment disorder?" or schizophren* or "psychotic disorder?" or psychoses or psychosis or "delusional disorder?" or hallucinat* or "paranoid disorder?" or paranoia? or "schizoaffective disorder?" or (substance adj ("use" or abuse or related) adj disorder?) or (alcohol adj ("use disorder?" or abuse or addiction or addict? or dependence or dependency)) or alcoholism or ((drug or opioid or cannabis or marihuana or marijuana or hashish or stimulant or sedative) adj ("use disorder?" or abuse or addiction or addict? or dependence or dependency)) or "behavio?ral addiction?" or "gambling disorder?" or neurodevelopment* or autis* or asd or "Asperger syndrom*" or adhd or "attention deficit hyperactivity disorder?" or "attention deficit disorder?" or "attention deficit and disruptive behavio?r disorder?" or tic? or Tourette* or (dissociative adj (disorder? or hysteria?)) or dereali#ation or depersonali#ation or (sleep* adj (disorder? or deprivation or deprived or problem? or difficult*)) or dyssomnia? or parasomnia? or insomnia?).tw,kf.	
5	1 and 2 and 3 and 4	97
6	limit 5 to yr="2014 -Current"	85
7	limit 6 to english	85
8	(comment or editorial or letter).pt.	2315626
9	7 not 8	85
10	limit 9 to "reviews (maximizes specificity)"	1
11	Meta-Analysis/ or Network Meta-Analysis/ or ((systematic* adj2 review*) or metaanal* or "meta anal*" or (review and ((structured or database* or systematic*) adj2 search*)) or "integrative review*" or (evidence adj2 review*)).tw,kf,bt.	617116
12	10 or (9 and 11)	3
13	9 not 12	82

Litteratursøk fra Bibliotek for helseforvaltningen

Dokumentasjon av søkestrategi

Database: Embase <1974 to 2025 March 05>
Date: 06.03.25
Numbers: 68 primary studies, 3 systematic reviews

1	child/ or boy/ or girl/ or preschool child/ or school child/ or childhood/ or juvenile/ or pediatrics/ or toddler/ or student/ or elementary student/ or middle school student/ or minor/ or exp Adolescence/ or exp Adolescent/ or high school student/ or (child* or pediatric* or paediatric* or preadolescen* or prepubescen* or preteen? or tween? or tweenager? or boy? or girl? or kid? or juvenil* or underage* or minor? or pubescen* or student* or toddler* or preschooler? or "pre schooler?" or adolescen* or teen? or teenage* or (young* adj (people or person*)) or youth*).tw,kf.	5296172
2	genetic risk score/ or (((polygenic or polygenetic or genetic? or genomic or genotype or genotypic or "genome wide" or genomewide) adj scor*) or ((polygenic or polygenetic or genetic? or genomic or genotype or genotypic or "genome wide" or genomewide) adj ("risk scor*" or "risk assessment?")) or "genetic liabilit*").tw,kf.	22295
3	"mother to child transmission"/ or "maternal fetal transmission"/ or ("nature of nurtur*" or "genetic nurtur*" or "indirect genetic*" or "virtual parent design" or "pseudo control" or "dynastic effect*" or intergeneration* or multigeneration* or ((transmit* or nontransmit*) adj allele*) or "passive gene environment correlation" or (genetic adj (inheritance or confounding*)) or ((genetic or parental or maternal or paternal or familial) adj transmission) or ((parental or maternal or paternal) adj influence?) or "social inheritance" or "social genetic effect*" or ((environmental or cultural or vertical) adj transmission) or "family based stud*" or "familybased stud*" or trio* or triad* or dual* or dyad*).tw,kf.	580055
4	mental disease/ or conduct disorder/ or oppositional defiant disorder/ or eating disorder/ or anxiety/ or anxiety disorder/ or panic/ or phobia/ or bipolar disorder/ or mood disorder/ or suicide/ or depression/ or major depression/ or automutilation/ or obsessive compulsive disorder/ or posttraumatic stress disorder/ or adjustment disorder/ or schizophrenia/ or psychosis/ or delusional disorder/ or hallucination/ or paranoia/ or schizo affective psychosis/ or substance abuse/ or alcohol abuse/ or alcoholism/ or drug abuse/ or drug dependence/ or cannabis addiction/ or behavioral addiction/ or pathological gambling/ or autism/ or attention deficit hyperactivity disorder/ or tic/ or Gilles de la Tourette syndrome/ or dissociative disorder/ or depersonalization/ or sleep disorder/ or (((Mental or psychiat* or psychological) adj (disorder? or disease? or illness* or problem?)) or "nervous breakdown?" or ("mental health" adj (disorder? or disease? or illness* or problem?)) or ((psychological or emotional) adj (distress or stress or problem?)) or psychopatholog* or internali* or externali* or "conduct disorder?" or "oppositional defiant disorder?" or (eating adj2 disorder*) or anorexi* or bulimi* or "binge eating" or orthorexi* or anxiety or anxious or angst or "panic disorder?" or phobi* or agoraphobi* or ((bipolar or manic) adj (disorder? or illness)) or "mood disorder?" or "bipolar affective psychos#s" or depression or depressive or dysthymi* or GAD or suicid* or (self adj (harm* or injur* or wounding or	2702345

Litteratursøk fra Bibliotek for helseforvaltningen

Dokumentasjon av søkestrategi

	mutilation)) or ("self inflicted" adj (harm or injur* or wound?)) or "self injurious behavio?r" or automutilation or "obsessive compulsive disorder?" or OCD or "compulsive obsessi* disorder?" or ((compulsive or obsessive) adj neurosis) or (("post traumatic" or posttraumatic) adj stress) or "acute stress disorder?" or "traumatic stress" or PTSD or "adjustment disorder?" or schizophren* or "psychotic disorder?" or psychoses or psychosis or "delusional disorder?" or hallucinat* or "paranoid disorder?" or paranoia? or "schizoaffective disorder?" or (substance adj ("use" or abuse or related) adj disorder?) or (alcohol adj ("use disorder?" or abuse or addiction or addict? or dependence or dependency)) or alcoholism or ((drug or opioid or cannabis or marihuana or marijuana or hashish or stimulant or sedative) adj ("use disorder?" or abuse or addiction or addict? or dependence or dependency)) or "behavio?ral addiction?" or "gambling disorder?" or neurodevelopment* or autis* or asd or "Asperger syndrom*" or adhd or "attention deficit hyperactivity disorder?" or "attention deficit disorder?" or "attention deficit and disruptive behavio?r disorder?" or tic? or Tourette* or (dissociative adj (disorder? or hysteria?)) or dereali#ation or depersonali#ation or (sleep* adj (disorder? or deprivation or deprived or problem? or difficult*)) or dyssomnia? or parasomnia? or insomnia?).tw,kf.	
5	1 and 2 and 3 and 4	211
6	limit 5 to embase status	83
7	limit 6 to yr="2014 -Current"	72
8	limit 7 to english	72
9	(Conference Abstract or Letter or Editorial).pt.	7569002
10	8 not 9	71
11	limit 10 to "reviews (maximizes specificity)"	1
12	exp Meta-Analysis/ or "systematic review"/ or ((systematic* adj2 review*) or metaanal* or "meta anal*" or (review and ((structured or database* or systematic*) adj2 search*)) or "integrative review*" or (evidence adj2 review*)).tw,kf,bt.	875857
13	11 or (10 and 12)	3
14	10 not 13	68

Litteratursøk fra Bibliotek for helseforvaltningen

Dokumentasjon av søkestrategi

Database: APA PsycInfo <1806 to March 2025 Week 1>
Date: 06.03.25
Numbers: 62 primary studies, 5 systematic reviews

1	Students/ or exp Elementary School Students/ or Middle School Students/ or Junior High School Students/ or Kindergarten Students/ or exp Preschool Students/ or Pediatrics/ or College Students/ or Middle School Students/ or Graduate Students/ or High School Students/ or Junior High School Students/ or Reentry Students/ or Special Education Students/ or Transfer Students/ or High School graduates/ or ("100" or "140" or "160" or "180" or "200").ag. or (child* or pediatric* or paediatric* or toddler* or preschooler? or "pre schooler?" or preadolescen* or prepubescen* or preteen? or tween? or teenager? or boy? or girl? or kid? or juvenil* or underage* or minor? or pubescen* or student* or adolescen* or teen? or teenage* or (young* adj (people or person*)) or youth*).tw.	1900035
2	((polygenic or polygenetic or genetic? or genomic or genotype or genotypic or "genome wide" or genomewide) adj scor*) or ((polygenic or polygenetic or genetic? or genomic or genotype or genotypic or "genome wide" or genomewide) adj ("risk scor*" or "risk assessment?")) or "genetic liabilit*").tw.	3175
3	Nature Nurture/ or ("nature of nurtur*" or "genetic nurtur*" or "indirect genetic*" or "virtual parent design" or "pseudo control" or "dynastic effect*" or intergeneration* or multigeneration* or ((transmit* or nontransmit*) adj allele*) or "passive gene environment correlation" or (genetic adj (inheritance or confounding*)) or ((genetic or parental or maternal or paternal or familial) adj transmission) or ((parental or maternal or paternal) adj influence?) or "social inheritance" or "social genetic effect*" or ((environmental or cultural or vertical) adj transmission) or "family based stud*" or "familybased stud*" or trio* or triad* or dual* or dyad*).tw.	134891
4	Mental Disorders/ or Psychological Stress/ or Psychopathology/ or Internalization/ or Externalization/ or Conduct Disorder/ or Oppositional Defiant Disorder/ or Eating Disorder/ or Anxiety/ or Panic Disorder/ or Phobias/ or exp Bipolar Disorder/ or Affective Disorders/ or Major Depression/ or "Depression (Emotion)"/ or Suicide/ or Nonsuicidal Self-Injury/ or Self-Inflicted Wounds/ or Obsessive Compulsive Disorder/ or Posttraumatic Stress Disorder/ or Adjustment Disorder/ or Schizophrenia/ or Psychosis/ or Delusional Disorder/ or Hallucinations/ or Paranoid Psychosis/ or Paranoia/ or Schizoaffective Disorder/ or Drug Abuse/ or Drug Dependency/ or Alcohol Abuse/ or "Opioid Use Disorder"/ or Nonsubstance Related Addiction/ or Gambling Disorder/ or Neurodevelopmental Disorders/ or Autism Spectrum Disorders/ or Attention Deficit Disorder with Hyperactivity/ or Tics/ or Tourette Syndrome/ or Dissociative Disorders/ or "Depersonalization/Derealization Disorder"/ or Depersonalization/ or Sleep Wake Disorder/ or (((Mental or psychiat* or psychological) adj (disorder? or disease? or illness* or problem?)) or "nervous breakdown?" or ("mental health" adj (disorder? or disease? or illness* or problem?)) or ((psychological or emotional) adj (distress or stress or problem?)) or psychopatholog* or internali* or externali* or "conduct disorder?" or "oppositional defiant disorder?" or (eating adj2 disorder*) or	1304457

Litteratursøk fra Bibliotek for helseforvaltningen

Dokumentasjon av søkestrategi

	anorexi* or bulimi* or "binge eating" or orthorexi* or anxiety or anxious or angst or "panic disorder?" or phobi* or agoraphobi* or ((bipolar or manic) adj (disorder? or illness)) or "mood disorder?" or "bipolar affective psychos#s" or depression or depressive or dysthymi* or GAD or suicid* or (self adj (harm* or injur* or wounding or mutilation)) or ("self inflicted" adj (harm or injur* or wound?)) or "self injurious behavio?r" or automutilation or "obsessive compulsive disorder?" or OCD or "compulsive obsessi* disorder?" or ((compulsive or obsessive) adj neurosis) or (("post traumatic" or posttraumatic) adj stress) or "acute stress disorder?" or "traumatic stress" or PTSD or "adjustment disorder?" or schizophren* or "psychotic disorder?" or psychoses or psychosis or "delusional disorder?" or hallucinat* or "paranoid disorder?" or paranoia? or "schizoaffective disorder?" or (substance adj ("use" or abuse or related) adj disorder?) or (alcohol adj ("use disorder?" or abuse or addiction or addict? or dependence or dependency)) or alcoholism or ((drug or opioid or cannabis or marihuana or marijuana or hashish or stimulant or sedative) adj ("use disorder?" or abuse or addiction or addict? or dependence or dependency)) or "behavio?ral addiction?" or "gambling disorder?" or neurodevelopment* or autis* or asd or "Asperger syndrom*" or adhd or "attention deficit hyperactivity disorder?" or "attention deficit disorder?" or "attention deficit and disruptive behavio?r disorder?" or tic? or Tourette* or (dissociative adj (disorder? or hysteria?)) or dereali#ation or depersonali#ation or (sleep* adj (disorder? or deprivation or deprived or problem? or difficult*)) or dyssomnia? or parasomnia? or insomnia?).tw.	
5	1 and 2 and 3 and 4	92
6	limit 5 to yr="2014 -Current"	77
7	limit 6 to english	69
8	("comment/reply" or editorial or letter).dt.	216409
9	7 not 8	67
10	limit 9 to "reviews (maximizes specificity)"	4
11	(meta analysis or "systematic review").md. or meta analysis/ or ((systematic* adj2 review*) or metaanal* or "meta anal*" or (review and ((structured or database* or systematic*) adj2 search*)) or "integrative review*" or (evidence adj2 review*)).tw.	130264
12	10 or (9 and 11)	5
13	9 not 12	62

Litteratursøk fra Bibliotek for helseforvaltningen

Dokumentasjon av søkestrategi

Database: Web of Science Core Collection: Science Citation Index Expanded (SCI-EXPANDED)--1987-present, Social Sciences Citation Index (SSCI)--1987-present, Arts & Humanities Citation Index. (AHCI)--1987-present, Emerging Sources Citation Index (ESCI)--2019-present

Date: 06.03.25

Note: Searched with "Exact search"

Numbers: 97 primary studies, 4 systematic reviews

1	TS=(child* or pediatric* or paediatric* or toddler* or preschooler\$ or "pre schooler\$" or preadolescen* or prepubescen* or preteen\$ or tween\$ or tweenager\$ or boy\$ or girl\$ or kid\$ or juvenil* or underage* or minor\$ or pubescen* or student* or adolescen* or teen\$ or teenage* or (young* NEAR/0 (people or person*)) or youth*)	4189885
2	TS=((((polygenic or polygenetic or genetic\$ or genomic or genotype or genotypic or "genome wide" or genomewide) NEAR/0 scor*) or ((polygenic or polygenetic or genetic\$ or genomic or genotype or genotypic or "genome wide" or genomewide) NEAR/0 ("risk scor*" or "risk assessment\$")) or "genetic liabilit*"))	14462
3	TS=("nature of nurtur*" or "genetic nurtur*" or "indirect genetic*" or "virtual parent design" or "pseudo control" or "dynastic effect*" or intergeneration* or multigeneration* or ((transmit* or nontransmit*) NEAR/0 allele*) or "passive gene environment correlation" or (genetic NEAR/0 (inheritance or confounding*)) or ((genetic or parental or maternal or paternal or familial) NEAR/0 transmission) or ((parental or maternal or paternal) NEAR/0 influence\$) or "social inheritance" or "social genetic effect*" or ((environmental or cultural or vertical) NEAR/0 transmission) or "family based stud*" or "familybased stud*" or trio* or triad* or dual* or dyad*)	956415
4	TS((((Mental or psychiat* or psychological) NEAR/0 (disorder\$ or disease\$ or illness* or problem\$)) or "nervous breakdown\$" or ("mental health" NEAR/0 (disorder\$ or disease\$ or illness* or problem\$)) or ((psychological or emotional) NEAR/0 (distress or stress or problem\$)) or psychopatholog* or internali* or externali* or "conduct disorder\$" or "oppositional defiant disorder\$" or (eating NEAR/1 disorder*) or anorex* or bulimi* or "binge eating" or orthorexi* or anxiety or anxious or angst or "panic disorder\$" or phobi* or agoraphobi* or ((bipolar or manic) NEAR/0 (disorder\$ or illness)) or "mood disorder\$" or "bipolar affective psychosis" or "bipolar affective psychoses" or depression or depressive or dysthymi* or GAD or suicid* or (self NEAR/0 (harm* or injur* or wounding or mutilation)) or ("self inflicted" NEAR/0 (harm or injur* or wound\$)) or "self injurious behavior" or "self injurious behaviour" or automutilation or "obsessive compulsive disorder\$" or OCD or "compulsive obsessive disorder\$" or "compulsive obsessional disorder\$" or ((compulsive or obsessive) NEAR/0 neurosis) or (("post traumatic" or posttraumatic) NEAR/0 stress) or "acute stress disorder\$" or "traumatic stress" or PTSD or "adjustment disorder\$" or schizophren* or "psychotic disorder\$" or psychoses or psychosis or "delusional disorder\$" or hallucinat* or "paranoid disorder\$" or paranoia\$ or "schizoaffective disorder\$" or (substance NEAR/0 ("use" or abuse or related) NEAR/0 disorder\$) or (alcohol NEAR/0 ("use disorder\$" or abuse or addiction or	2107482

Litteratursøk fra Bibliotek for helseforvaltningen

Dokumentasjon av søkestrategi

	addict\$ or dependence or dependency)) or alcoholism or ((drug or opioid or cannabis or marihuana or marijuana or hashish or stimulant or sedative) NEAR/0 ("use disorder\$" or abuse or addiction or addict\$ or dependence or dependency)) or "behavioral addiction\$" or "behavioural addiction\$" or "gambling disorder\$" or neurodevelopment* or autis* or asd or "Asperger syndrom*" or adhd or "attention deficit hyperactivity disorder\$" or "attention deficit disorder\$" or "attention deficit and disruptive behavior disorder\$" or "attention deficit and disruptive behaviour disorder\$" or tic\$ or Tourette* or (dissociative NEAR/0 (disorder\$ or hysteria\$)) or derealisation or derealization or depersonalisation or depersonalization or (sleep* NEAR/0 (disorder\$ or deprivation or deprived or problem\$ or difficult*)) or dyssomnia\$ or parasomnia\$ or insomnia\$)	
5	#4 AND #3 AND #2 AND #1	112
6	#4 AND #3 AND #2 AND #1 Timespan: 2014-01-01 to 2025-03-06	101
7	(#4 AND #3 AND #2 AND #1) AND (LA=="ENGLISH") Timespan: 2014-01-01 to 2025-03-06	101
8	TS= (("systematic*" NEAR/1 "review*") or ("review" and (("structured" or "database*" or "systematic*") NEAR/1 "search*")) or "integrative review*" or ("evidence" NEAR/1 "review*")) OR TI= ("metaanal*" or "meta anal*") OR AB= ("metaanal*" or "meta anal*")	704485
9	#7 AND #8	4
10	#7 not #9	97