Identification of child mental health problems in primary care: an interdisciplinary approach

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Chapter 2

Factors associated with the identification of child mental health problems in primary care - a systematic review

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Abstract

Background: Although common and often with long-lasting effects, child mental health problems (MHPs) are still under-recognized and under-treated. A better understanding of the factors associated with the identification of MHPs in primary care may improve the recognition of MHPs.

Objectives: To review studies on factors associated with the identification of child MHPs in primary care.

Methods: Six leading databases were systematically searched until 1 October 2018. Two independent researchers selected articles and extracted data on study characteristics and factors associated with MHP identification. Inclusion criteria were the investigation of factors associated with MHP identification by primary care professionals (PCPs) in children aged 0-18 years.

Results: Of the 6,215 articles identified, 26 were included. Prevalence rates of PCP-identified MHPs varied between 7 and 30%. PCPs identified 26 and 60% of children with an increased risk of MHPs as indicated by MHP assessment tools, but associated factors were investigated in relatively few studies. MHPs were more often identified in children with a family composition other than married parents, with worse mental health symptoms, prior MHPs, among boys in elementary school, when contact with PCPs was related to parental psychosocial concerns or routine health check-ups, when PCPs were recently trained in MHPs or when PCPs felt less burdened treating MHPs.

Conclusion: MHP identification varied substantially between studies and PCPs and was related to several child, family and practice factors. Future studies should systematically investigate factors associated with MHP identification by PCPs and specifically in children with an increased risk of MHPs according to mental health assessment tools.

Introduction

Mental health problems (MHPs), defined as any emotional, behavioural or developmental problems, are common in children and adolescents(1, 2). The severity of MHPs varies widely, from children with mild problems without impairment, to children with severe impairment(3). MHPs often have a negative influence on a child's everyday functioning and well-being and may lead to various adverse outcomes later in life such as a poorer performance at school and/or on the job market and a higher risk of impediment due to a Diagnostic and Statistical Manual of Mental Disorder (DSM) diagnosis later in life(4-10). Early identification of MHPs in children is thus important in order to provide adequate treatment strategies and prevent adverse outcomes.

Primary care has a central role in the identification and treatment of children with MHPs(10). Most countries distinguish primary care professionals (PCPs) who provide preventive care (i.e. preventive youth healthcare focusing on the healthy development of a child) from those PCPs providing curative care (i.e. general practice or paediatric consultation focused on resolving health problems). The majority of children and adolescents in Western societies visit any PCP at least once a year(11-13). Seeing children regularly throughout childhood, PCPs are in a unique position to manage child MHPs(14). Governments in developed countries now have a greater awareness of PCPs as the 'gatekeepers' of child mental health services(14-17).

Although children regularly visit a PCP, several children will not be recognized as having MHPs(18-21). For example, in two cohort studies conducted among children visiting a PCP for a routine health assessment in the US and the Netherlands, PCPs did not recognize MHPs in 50% and 43% respectively of the children with elevated scores on mental health screening tools(22, 23). A potential explanation might be that relevant information is not (explicitly) shared by parents. MHPs in children consequently remain undertreated and a large proportion of children with MHPs do not receive adequate care (24, 25).

Over a decade ago, two reviews identified several sometimes contrasting factors associated with identified child MHPs. Both reviews prioritized further research in primary care settings that explored child, parental and service factors influencing primary care identification(25, 26). Since then, new studies regarding the identification of child MHPs in primary care have been conducted. The present study aimed to review systematically the current literature regarding factors associated with PCP identification of child MHPs. In addition, we investigated factors associated with PCP identification of children with an increased risk of MHPs as assessed by MHP screening tools.

Methods

Search strategy

We conducted a systematic search for original articles published before 1 October 2018. A search strategy including MeSH terms and broad concepts such as 'psychosocial problems' and narrow diagnoses such as 'anxiety disorder', was developed for PubMed and adapted for equivalent searches in Embase, CINAHL, Web of Science, Cochrane and PsycINFO (Supplement table 1). In addition, we performed a grey literature search in seven databases (WHO database, OpenGrey, GreyLit, GLIN (Grey Literature in the Netherlands), Academic Search Premier, Clinical Trials and Current Controlled Trials) in order to avoid missing relevant titles published outside the conventional databases.

Inclusion and exclusion criteria

The title and abstract and after that the full text of the articles were independently screened by two authors (NK and FB) using predefined inclusion and exclusion criteria. We included studies that: (1) focused on children aged 0-18 years who visited a PCP (directly or indirectly through parents or caretakers), (2) examined PCP-identified MHPs, and (3) explored factors associated with identified MHPs. We defined MHPs as any emotional, behavioural or developmental problem causing mild to severe impairment. Exclusion criteria were: (1) articles that contained non-original data, (2) reviews, dissertations, book chapters, case reports, editorials, oral presentations and poster presentations, and (3) articles published in a language other than English or Dutch.

Quality appraisal

Quality assessment of the included studies was performed by a critical appraisal based on standardized criteria using the Crowe Critical Appraisal Tool (CCAT). The CCAT has been tested for validity and reliability(27-30). Two researchers (NK and MV) appraised the articles independently. Discrepancies in scores were mostly attributable to different interpretations of a sub-item and were discussed in a group meeting with NK, MV and MC until consensus was reached. We did not have a pre-specified CCAT score under which we would exclude a study.

Data extraction

We extracted general descriptive characteristics from the included studies, as well as factors associated with MHP identification and their effect measures e.g., relative risks or odds ratios. In cases where no effect measure was present, a description of the association between the factor and the outcome was obtained from the text; if this was not reported the study was excluded from further analyses. Unless otherwise specified, only factor associations adjusted for other background variables are presented.

Results

Our initial search resulted in 6,215 original titles (Figure 1). Screening of titles, abstracts and full texts resulted in the inclusion of a final set of 26 studies. Reasons for excluding studies were related to a lack of focus on factors associated with PCP identification of MHPs or a study outcome other than PCP-identified MHPs. Quality appraisal scores for the 26 studies ranged from 24 to 33 points (maximum 40), with an average of 27.8 points (Supplement Table 2). Since we did not assign extremely low or high quality scores, no studies were excluded from further analysis based on the CCAT.

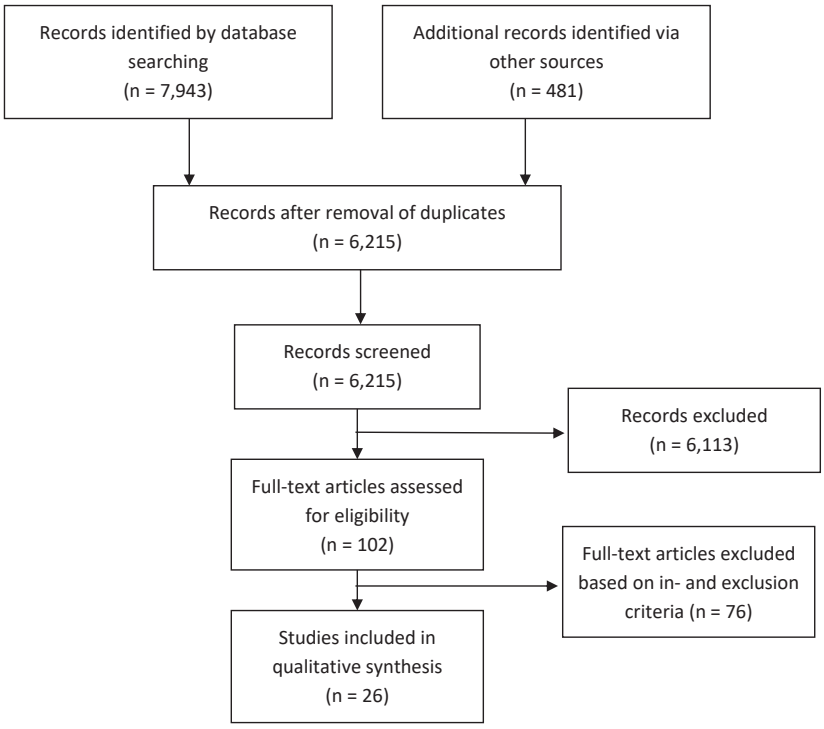

Figure 1. Flow diagram of the article inclusion process

General description

The 26 included studies were published between 1992 and 2018 (Supplement Table 3a). Twelve studies were performed in the US (22,31-41), 11 in the Netherlands(19, 20, 23, 42-49) and three in the UK(21, 50, 51). The study setting was general practice in seven studies(19, 21, 22, 36, 39, 50, 51), preventive youth healthcare in 15(20, 23, 31, 34, 37, 40-49) and combined preventive youth healthcare and general practice in

four studies(32, 33, 35, 38). All included studies involved cross-sectional analyses of children visiting a PCP. No study included all children in the age range 0-18 years, and most often studies focused on children aged 5-12 years. The studies used different inclusion and exclusion criteria, e.g. regarding age groups, exclusion of children with prior MHPs and acute care visits. Owing to differences between included studies, we present the direction of the associations between investigated factors and the identification of MHPs by PCPs.

MHPs in general (i.e. the broad concept of MHPs) were investigated in 24 studies, mostly by asking the PCP whether MHPs were currently present without defining MHPs specifically(20-23, 31-35, 37-40, 42-50). One study investigated only depression and anxiety(36), another only depression(51). Twenty-four studies included information on factors associated with MHPs identified by child, parent and professional questionnaires(19-23, 31-40, 42-50), sometimes (additionally) by chart review(36, 41, 51), by interviews with the child/parent(19, 23, 36, 44, 45), or by videotape analysis(39). Thirteen studies compared PCP identification with scores on mental health assessment tools; the results of these studies will be discussed separately(21-23, 32, 36, 38, 42, 44-46, 48-50).

PCPs identified an MHP in 7%-30% of children (Supplement Table 3b). Overall, we found that PCP identification rates were higher in studies that included only preventive care compared to studies that also included curative care.

Factors associated with PCP identification of MHPs: child characteristics

In children of junior school age (4-12 years), boys were more often identified with MHPs. However, this was not the case in younger or older children (Table 1)(19, 23, 33, 34, 36, 40, 42, 44, 46, 47, 49, 50). More MHPs were identified in children with parent-reported problems related to school, and MHPs were also more frequently identified in school-aged children experiencing life events (e.g. divorce) in the past year(23, 42, 49, 51).

Somatic complaints (e.g. headache) and a past (treatment for a) MHP were also related to increased MHP identification, whereas more visits to a PCP in the past year was only related to MHP identification in the case of adolescents(23, 31, 35, 36, 42, 44, 47, 49, 51). Neonatal/developmental problems, comorbid conditions, a child's age or ethnicity were not (consistently) related to MHP identification(19, 20, 23, 31, 33-37, 40, 42-45, 47, 49-51).

Characteristics of parent/family

Children with a family structure other than married parents were more often recognized with MHPs in five studies, whereas two studies found no association(23, 31, 33, 34, 37, 42, 47). MHPs were also more often identified in children living in a deprived area(43, 51).

Associations between parental education, socio-economic status, employment status, a family history of MHPs and identified MHPs were inconclusive(19, 23, 32, 33, 40, 42, 44, 46, 47, 49, 50). Other characteristics of the parent/family did not impact MHP identification.

Professional, practice and visit characteristics

PCP characteristics (e.g. age, gender and work experience) and practice characteristics (e.g. practice type and accessibility of mental healthcare) did not influence PCP identification of MHPs(31, 33-35, 41, 46). PCPs with less focus on psychosocial well-being identified fewer children with MHPs(33), while PCPs experiencing a lower burden in treating MHPs identified more children(35). The training of PCPs in MHP identification resulted in increased identification when such training had recently taken place(33, 35, 48).

Children visiting a PCP for a well-child visit(34, 40) or for psychosocial concerns(33, 35), and children well-known to a PCP (i.e. the PCP was the child's usual medical provider), were more often identified with an MHP(33, 40). However, MHPs were more often identified only when PCPs or observers reported discussion of MHPs during consultations. When parents reported discussion or when parents used a checklist to prompt parental disclosure of child MHPs, MHP identification did not increase(21, 22, 35, 39, 40, 50).

Three studies examined between-professional variance in the identification of child MHPs(37, 46, 47). Between-professional variance could not be explained by parent-reported problems(37) or any child-related characteristic(37, 46), and could only be partly explained by PCP or practice characteristics(37, 46, 47).

Identification of children with an increased risk of MHPs

Thirteen studies compared PCP identification with scores on mental health assessment tools. PCPs recognized MHPs in 26-60% of the children with elevated scores on assessment tools (for purposes of simplification further indicated as 'correct' identification)(21-23, 32, 36, 38, 42, 44-46, 48-50). Seven studies investigated factors associated with 'correct' identification, though most studies only investigated one factor. PCPs more often identified children with an increased risk of MHPs when children were older, were boys, well-known to their clinician, were visiting for a psychosocial problem, when PCPs used an assessment questionnaire such as the Child Behavior Checklist (CBCL) or when PCPs were trained in MHP recognition(34, 38, 46, 48). Practice type, ethnicity, family composition, PCP work experience and parent-reported concerns showed no consistent association with 'correct' identification(32, 34, 38, 45, 46, 48). One study found that physicians experiencing a higher MHP burden identified fewer children with problems as evaluated by mental health assessment tools, but identified more children in whom assessment tools did not indicate MHPs(35).

Table 1. Associations between the investigated factors and PCP identification of mental health problems

	Factor associated with mental health problem identification[a]	Number of studies
Child	Higher age	9
	Male gender	12
	Ethnicity	9
	Smoker	1
	Alcohol/drugs misuse	1
	Life events in past year	4
	Parent report of school problems	2
	Child-perceived difficulties	2
	More visits in past year	4
Medical history	Neonatal/developmental problems	1
	Comorbid conditions	7
	Somatic complaints	1
	Past MHP	1
	Past treatment for MHP	5
	Child health limitation – parent impression	1
Mental health problems based on tool	Child's MHP - clinical total score	11
	Child's MHP - clinical internalizing/ emotional symptom score	6
	Child's MHP – clinical externalizing/ behavioural symptom score	5
	SDQ burden to family	1
	Parent-perceived difficulties (on SDQ)	2
	Teacher reported MHP on TRF	1

	Positive association with identified mental health problems number of studies	Negative association with identified mental health problems number of studies	No association with identified mental health problems number of studies
	5	2, of which 1 study for only age 12-16	2
	7, of which 1 study only for age 4-11[a]		6, of which 1 only for age 12-17
	Economic immigrant: 1	Black: 1 Hispanic: 1	8, of which 1 specifically for ethnicity former colonies/ other (non-) industrialized countries
	1		
	Alcohol misuse in boys: 1		Drugs misuse: 1
	2		2
	2		
			2
	2		2
			1
		1	6
	1, for e.g. headache, back pain, tiredness		
	1		
	General treatment: 3 Psychological treatment: 2 Medical treatment:2; Other treatment: 1		Other treatment: 1
	1, only for age 12-17		1, only for age 4-11
	10		1
	4, of which 1 specifically anxiety/depression symptoms		2
	3		2
	1		
	1		1
	1, only for age 4-11		

Table 1. Continued

	Factor associated with mental health problem identification[a]	Number of studies
Parent/family	Older maternal age	1
	Family structure other than married parents	7
	Absence of siblings	3
	Higher parental education	7
	Parent unemployed/working <16 h/week	2
	Lower socioeconomic status	2
	Higher area deprivation[b]	2
	Highly urbanized area of home address	2
	Parental distress	2
	Better family functioning	1
	Day care	1
	Parenting practice	1
	Parent sense of competence being parent	2
	Parent positive affect or negative affect	1
	Parent poor MH status/MHP history	2
Perinatal characteristics	Duration of pregnancy, type of delivery, post-delivery hospitalization of child, birth weight, parity	1
Professional	Higher age	3
	Male gender	2
	More work experience	3
	Professional training MHP	
	Child well-known	2
	Lower psychosocial orientation	1
	More perceived efficiency treating MHP	1
	Lower physician burden	2
	Physician training in MHP	3
	Job satisfaction	1
	Job control	1
	Use of screening tool	3

	Positive association with identified mental health problems number of studies	Negative association with identified mental health problems number of studies	No association with identified mental health problems number of studies
	1		
	5		2
			3
		4, of which 1 study only for high level	4, of which 1 study only average level
			2
		1	1
	2		
	1		1
			2
		1	
		1	
		Over reactive style: 1	Lax style: 1
	1		1
			1
	1		1
			All separately investigated: 1 All together investigated but hospitalization and parity: 1
			3
			2
		>21 years: 1	3, of which 1 only for <21 years
	2		
		1	
			1
	1		1
	Training 3 months ago: 1		3, of which1 for training 6 months ago
			1
			1
	On indication: 1	Always/on indication use of CBCL: 1	Always/on indication use of LSPPK/TRF: 1 Always: 1

Table 1. Continued

	Factor associated with mental health problem identification[a]	**Number of studies**
Practice	Practice type (solo/group neighbourhood health centre, prepaid group, multi-specialty)	2
	Low accessibility MH specialist	3
	Composition of practice	1
Visit	Type of visit	5
	Season of visit	1
	Parent reported discussion MHP	2
	Physician reported MHP exploration/parental disclosure	3
	Parent initiated disclosure negative psychosocial information (researcher determined)	1
	Parent checklist prompting parental disclosure	1
	Longer duration of visit	1

[a] Not included in this table are the associations with identified mental health problems in children with increased scores on mental health problem assessment tools, [b] Composite, based on postcodes, degree of urbanization, proportion of ethnic minorities, mean income per earner.

	Positive association with identified mental health problems number of studies	Negative association with identified mental health problems number of studies	No association with identified mental health problems number of studies
			2
	1		2
			1
	Well-child: 2 Psychosocial: 2		Visit not for MHP: 1
			1
	1		1
	3		
	1		
			1
	1		

[c] This study presented associations separately for the two age groups 4-11 and 12-17 years (19); different findings for the different age groups are therefore specified. LSPPK = National checklist indicating psychosocial problems in 5-year-olds. MH = Mental health, MHP = mental health problem, SDQ = Strengths and difficulties questionnaire, TRF = Teacher report form

Discussion

Main findings

This study presents the results of a systematic review of literature regarding factors associated with the identification of child MHPs by primary care professionals (PCPs). Most of the included studies were performed in the US and the Netherlands. Prevalence rates of identified MHPs varied between studies and PCPs recognized 26-60% of children with an elevated score on MHP screening tools. Overall, we found that MHPs were more often identified among children with mental health symptoms, with a family composition other than married parents and with a history of MHPs. Boys in junior school and children who visited a PCP regarding psychosocial concerns or a well-child visit were also more often identified with an MHP. PCPs who felt less burdened treating MHPs and PCPs recently trained in child MHPs were more likely to identify MHPs and also more likely to recognize MHPs in children showing an increased score on MHP assessment tools. Interestingly, discussion of MHPs during a consultation only resulted in more PCP-identified MHPs when the exploration was reported by PCPs, but not when parents reported the exploration. No clear association was found between other background characteristics of child, family, and professionals and PCP identification of child MHPs.

Comparison with previous reviews

In line with reviews by Zwaanswijk et al.(26) and Sayal et al.(25), published over a decade ago and based on fewer studies, our study confirms the association of the factors family composition, past treatment for MHPs, severity of child psychopathology, mental health symptoms, type of visit, professional acquaintance with the child, professional training, parental expression of concerns with the identification of child MHPs by PCPs. In addition, we found that prior life events led to more MHPs identified only during school age(19, 23, 31-38, 42, 44, 47, 49-51). Zwaanswijk et al. and Sayal et al.(25, 26) included fewer studies reporting on this association and did not mention a difference in the association between prior life events and MHP identification across ages.

Sayal et al.(25) also reported that other factors preventing GPs from recognizing or dealing with mental health issues are likely to reflect lack of confidence, skills or knowledge. This is in line with our findings that PCP identification was influenced by the PCP's psychosocial orientation and the PCP's experienced burden treating MHP.

In contrast to Zwaanswijk et al. and Sayal et al.(25, 26), our study did not confirm the association between male gender and increased MHP identification across all ages. Our study showed that male gender was only associated with increased identification at junior school age, a finding that may be related to the fact that boys have higher rates

of problems and that MHPs become more apparent at the age when a child enters the school setting(3, 49). In addition, we did not find a clear association between a child's age and MHP identification. Zwaanswijk et al.(26) reported a clear association between older age and MHP identification, while Sayal et al.(25) only reported a similar result in studies performed in both preventive and curative care or in curative care only. However, Sayal et al.(25) found that a younger age was associated with MHP identification in one study performed in preventive care only(25). In our study, the study setting did not impact the association between age and MHP identification. Also, we did not find an association between limited service availability to refer patients to and a decreased MHP identification.

The number of MHPs identified by PCPs varied between studies, with lower rates found in studies involving younger children. More importantly, however, we found that identification rates varied between similar professionals within studies(37, 46, 47). This variance could not be explained by child characteristics(37, 46) and could only be partly explained by the included PCP or practice characteristics(37, 46, 47). Nevertheless, a large part of the variation in identification rates remained unexplained, suggesting that other factors in the recognition process play a role. To improve the identification of child MHPs, and decrease the inter-professional variation in identification, we suggest that the knowledge gap explaining the inter-professional variation should be targeted in future studies. For instance, good professional training and the use of protocols have shown to reduce inter-professional variation and improve the identification of problems in children showing elevated scores on MHPs assessment tools(20, 48). Proper professional training is also likely to influence positively the PCP's focus on psychosocial well-being and PCP experienced burden treating MHPs, factors that were reported to impact PCP identification of child MHPs in our study. The importance of training and skills was also confirmed by PCP-reported barriers to the identification of MHPs(14, 52-55). However, it should be taken into account that training activities may be time-consuming and that training activities may only improve MHP identification in the short term(20, 48).

The identification of MHPs was related to the number of mental health symptoms and a history of problems, both signifying more severe problems(19, 34, 35, 37, 42, 44, 46, 47, 49, 50). Parental disclosure of mental health concerns only resulted in higher identification rates when professionals recognized that parents had raised concerns(21, 22, 50). Parents might fail to disclose their concerns effectively(39), and professionals often do not agree with parent-reported concerns or that psychosocial information was discussed during consultation(22). Other explanations might relate to professionals not adequately responding to parental disclosure or to other as yet unknown factors in the recognition process.

Strengths and limitations

We used a wide-ranging search strategy in leading medical and psychological databases and in the grey literature to avoid overlooking relevant articles. This approach expands on two prior reviews which used relatively short search strategies limited to either two or three databases(25, 26).

An important feature of this review was the inclusion of studies performed in both preventive care and curative care. Although healthcare systems worldwide vary considerably, a preventive healthcare programme for children can be found in most countries, and primary care attendance rates are consistent among different healthcare systems(10, 56, 57). The inclusion of studies from both settings also provided broader information on factors associated with the identification of child MHPs by professionals in primary care. While not all factors were investigated in studies of both preventive and curative care, factors that were investigated in studies that included both settings generally showed similar associations when compared to studies performed in only one setting.

Unfortunately, most studies did not include an independent assessment of the child's mental health, e.g. by a questionnaire such as the CBCL. PCP recognition differed between professionals, so some PCPs appear more inclined to identify MHPs than others. It is also possible that some PCPs were more focussed on reporting MHPs in specific children, e.g. in children with divorced parents. Therefore, the associations found in our study do not necessarily predict actual MHPs. Future studies should compare factors associated with PCP-identified MHPs and factors associated with objectively proven MHPs.

In addition, most studies did not define the term child MHPs. This may have impeded the comparison of study results and might (partly) explain the wide variation in identification rates. The included studies, however, reflect the identification process as found in daily practice and most studies measured identification by asking the professional whether they thought an MHP was present, indicating the investigation of a broad concept of MHPs, which corresponded with the aim of our study(20-23, 31-35, 37-40, 42-50).

Additionally, in this review we only presented results after adjustment for several background variables. As the included studies adjusted for different sets of background variables, this probably hampered comparability of the studies. In studies that also reported univariable analyses, the univariable results did not alter conclusions based on multivariable results.

Implications

Some characteristics were investigated in only one study, while the identification of MHPs indicated by mental health assessment tools was investigated in relatively few studies. An increased risk flagged by MHP assessment tools only indicates that a child might experience problems and that further attention is warranted, it does not imply an MHP diagnosis. To obtain more robust evidence regarding factors associated with PCP-identified MHPs, and especially the identification of children with an increased risk of MHPs, we recommend better exploration of factors determining identification of child MHPs by PCPs.

In addition, further insight into the factors explaining variations in MHP identification is needed. This could be facilitated by a study design in which the actual identification process is monitored. The next challenge is to decrease variation in identification and to ensure that the right children are identified. Training and screening tools might increase the sensitivity of professionals (and decrease variation) but might also lead to an increase in the number of children identified and thus to more 'false positives' needing additional assessment(58). An understanding of the factors associated with missed MHP identification in children flagged by independent mental health assessment is important to the framing of strategies and policies to improve identification. In this review, we identified relatively few studies investigating this problem. As mentioned above, we recommend that this issue should be targeted in future studies. Combining data from different sources, including data from routine healthcare, might have great potential for improving MHP recognition(59). For example, in the Netherlands each child participates in regular preventive health assessments performed in community paediatric centres, thus providing a long-term overview of the child's health status. Additionally, a general practitioner is usually consulted when children or parents have health problems and can, therefore, monitor family developments and possible effects on a child's health(19, 56). Combining complementary information from different sources might aid better problem identification.

Conclusion

MHPs were more often identified in children with more mental health symptoms, with prior MHPs, among boys in junior school or as a result of visits to PCPs related to psychosocial concerns or well-child visits. In addition, PCPs who felt less burdened treating MHPs and PCPs who were recently trained in child MHPs were more likely to identify MHPs, and more likely to recognize MHPs in children with an increased score on MHP assessment tools. Factors associated with PCP-identification of children with an increased risk of MHPs were largely comparable with factors associated with MHP identification in general, but were investigated in relatively few studies.

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Supplementary files

Supplement Table 1. Search strategy

("child" OR "children" OR "childhood" OR "infant" OR "infants" OR "infancy" OR "kid" OR "kids" OR "youth" OR "youngster" OR "youngsters" OR "toddler" OR "toddlers" OR "childhood" OR "adolescent" OR "adolescents" OR "baby" OR "juvenile" OR "offspring" OR "teenager" OR "teenagers" OR "newborn" OR "newborns") **AND** ("psychosocial problem" OR "psychosocial problems" OR "psychosocial issue" OR "psychosocial issues" OR "psychosocial disorder" OR "psychosocial disorders" OR "psychological problem" OR "psychological problems" OR "psychological issue" OR "psychological issues" OR "psychological disorder" OR "psychological disorders" OR "mental health" OR "mental health problem" OR "mental health problems" OR "mental health issue" OR "mental health issues" OR "mental health disorder" OR "mental health disorders" OR "mental disorders" OR "behaviour problem" OR "behaviour problems" OR "behaviour issue" OR "behaviour issues" OR "behaviour disorder" OR "behaviour disorders" OR "behavior problem" OR "behavior problems" OR "behavior issue" OR "behavior issues" OR "behavior disorder" OR "behavior disorders" OR "emotional problem" OR "emotional problems" OR "emotional issue" OR "emotional issues" OR "emotional disorder" OR "emotional disorders" OR "psychiatry" OR "psychopathology" OR "internalizing" OR "externalizing" OR "internalising" OR "externalising" OR "internalized" OR "externalized" OR "internalised" OR "externalised" OR "internalize" OR "externalize" OR "internalise" OR "externalise" OR depress* OR "attention deficit" OR "attention deficits" OR "oppositional defiant disorder" OR "autism spectrum disorder" OR "Conduct Disorder" OR "Conduct Disorders" OR "disruptive behavior" OR "disruptive behaviors" OR "disruptive behaviour" OR "disruptive behaviours" OR "ADHD" OR "ODD" OR "ADD" OR "Autism" OR "Aspergers syndrome" OR "Asperger's syndrome" OR asperger* OR autis* OR "Conduct Disorder" OR "Conduct Disorders" OR "anxiety problem" OR "anxiety problems" OR "anxiety issue" OR "anxiety issues" OR "anxiety disorder" OR "anxiety disorders") **AND** ("primary health care" OR "primary healthcare" OR "primary care" OR "general practitioner" OR "general practitioners" OR "general practice" OR "family physician" OR "family physicians" OR "family practice" OR "GP" OR "G.P." OR "Child Health Service" OR "Child Health Services" OR "Infant Health Service" OR "Infant Health Services" OR "pediatrician" OR "pediatricians" OR "paediatrician" OR "paediatricians" OR "CHP" OR "CHPs" OR "CHP's" OR "child health care" OR "child healthcare" OR "child health professional" OR "child health professionals" OR "youth healthcare" OR "youth health care") **AND** ("identification" OR "recognition" OR "detection" OR "signaling" OR "signalling" OR "signal" OR "signals" OR "discovering" OR "finding" OR "exploration" OR "detect" OR "recognise" OR "identificate" OR "early diagnosis")

Supplement Table 2. Quality appraisal of included studies assessed with the Crowe Critical Appraisal Tool

Year, 1st author, Country	Total score (max = 40)	Preamble	Introduction
1992 Horwitz(31) US	26	4	4
1997 Kelleher(32) US, PR, Canada	32	5	5
1997 Lynch(39) US	27	4	5
1998 Horwitz(40) US	26	4	4
1999 Kelleher(38) US	29	4	4
1999 Wildman(22) US	25	4	4
2001 Brugman(23) NL	24	4	4
2001 Scholle(33) US, PR, Canada	27	4	5
2004 Leaf(34) US	28	4	4
2004 Reijneveld(41) NL	25	4	4
2004 Sayal(21) UK	25	3	4
2005 Reijneveld(42) NL	25	5	4
2005 Reijneveld(20) NL	29	4	4
2005 Zwaanswijk(19) NL	28	4	4
2006 Martinez(48) UK	27	4	4
2006 Wiefferink(47) NL	29	5	4
2007 Brown(35) US	25	3	4
2008 Vogels(46) NL	31	4	4
2009 Klein Velderman(43) NL	30	4	5
2010 Crone(44) NL	30	4	4
2010 Richardson(36) US	27	4	3
2012 Dempster(37) US	28	4	4
2012 Theunissen(45) NL	27	4	4
2016 Crone (49)NL	32	5	5
2016 Mayne (41)NL	28	4	4
2018 Nichols (51)UK	33	5	5

NL = the Netherlands, PR = Puerto Rico, UK = United Kingdom, US = United States

Design	Sample	Data	Ethics	Results	Discussion
3	3	3	2	3	3
4	3	4	4	3	4
3	3	3	3	3	3
3	3	3	2	3	3
4	3	4	3	4	3
2	3	4	2	3	3
3	3	3	2	3	2
2	3	3	3	4	3
3	3	3	3	4	4
3	3	3	2	3	3
2	3	4	3	3	3
2	3	3	2	4	2
3	3	4	3	4	4
3	4	3	4	4	2
2	4	3	4	2	4
4	3	3	4	3	3
3	3	3	2	3	4
4	4	4	3	4	4
4	3	4	4	4	4
3	4	4	3	4	4
3	3	3	3	4	4
4	3	3	3	4	5
2	4	3	2	4	4
3	3	4	4	4	4
3	3	4	4	3	3
4	4	4	4	3	4

Supplement Table 3a. Characteristics of included studies – study characteristics[a]

Year 1st author Country	Design	Primary Care Setting	Population	Inclusion criteria
1992 Horwitz (31) US*	Cross-sectional analysis within community based cohort study	Youth healthcare including acute care visits	1886 children age 4-8 years	First visit of all children visiting a clinician within 2 designated time periods
1997 Kelleher(32) US, PR, Canada**	Cross-sectional analysis within cohort study	Youth healthcare and general practice	1100 children age 4-15 years with + PSC-score	Children consecutively presenting physicians for non-emergent services with parent/caretaker; excluding visits for procedures only and missing data
1997 Lynch(39) US	Not randomized experimental study to evaluate a method of prompting parental PsP disclosure	General practice	60 parents and professionals of children age 3-10 years	Parents of 60 children visiting for well-care or acute-care examination not specifically for psychosocial reasons
1998 Horwitz(40) US*	Cross-sectional analysis within community based cohort study	Youth healthcare including acute care visits	1841 children age 4-8 years	First visit of all children visiting a clinician within 2 designated time periods

	Factors investigated	Outcome + measure	Analysis*	Analysis additionally adjusted for
	Child: CBCL, characteristics Family: characteristics Professional: (visit) characteristics	Mental disorders, psychological symptoms and social problems rated by professional on a developed checklist of psychosocial and developmental problems	Univariable frequencies	NA
	Child: PSC, characteristics Family: characteristics, family functioning, insurance status Professional: (visit + practice) characteristics	Professional answered: 'Is there a new, ongoing, or recurrent PsP present?' I.e. any mental disorders, psychological symptoms or social situations warranting clinical attention or intervention	Multilevel multivariable regression	Ethnicity, age, gender, family composition, PSC-score, parent education, family functioning, clinician type, age, sex beliefs, number of children enrolled in study, well-known child, well-child visit, practice structure, % managed care patients, children within practices.
	Child: CBCL, characteristics Family: characteristics, psychosocial disclosures Professional: characteristics	Professional answered whether the child displayed evidence of PsP requiring further treatment.	Univariable regression	NA
	Child: CBCL, characteristics Family: characteristics Professional: (visit) characteristics	Professional rated specific problems on a developed checklist of psychosocial and developmental problems	Multivariable regression	NA

Supplement Table 3a. Continued

Year 1st author Country	Design	Primary Care Setting	Population	Inclusion criteria
1999 Kelleher(38) US, PR, Canada¨	Cross-sectional analysis within cohort study	Youth healthcare and general practice	1913 children age 4-15 years with + PSC-score	Children consecutively presenting physicians for non-emergent services with a parent/caretaker speaking English/Spanish; excluding visits for procedures only and missing data
1999 Wildman (22) US	Cross-sectional	Community based general practice centre	75 parents of children age 2-16 years	English-speaking patients visiting a physician. Excluded: patients who had completed similar questionnaires previously or failed to complete all questionnaires
2001 Brugman (23) NL	Cross-sectional	Youth healthcare without acute care visits	3990 children age 5-15years	Per centre: all children in 3 school classes for 2nd, 4th, 7th (primary school) and 2nd grade (secondary school). Excluding children with incomplete data or currently treated for PsP
2001 Scholle(33) US, PR, Canada	Cross-sectional analysis within cohort study	Youth healthcare and general practice without acute care visits	19 963 children age 4-15 years	Children consecutively presenting physicians for non-emergent services with a parent/caretaker speaking English/Spanish; excluding visits for procedures only or missing data
2004 Leaf(34) US	Cross-sectional analysis within community based cohort study	Youth healthcare including acute care visits	1629 children age 4-8 years	The first visit of all children visiting a clinician within 2 designated time periods

	Factors investigated	Outcome + measure	Analysis*	Analysis additionally adjusted for
	Child: PSC, characteristics Family: characteristics, family functioning, Insurance status Professional: (visit + practice) characteristics	Professional answered: 'Is there a new, on-going, or recurrent PsP present?' I.e. any mental disorders, psychological symptoms, or social situations warranting clinical attention or intervention	Multilevel multivariable regression	Parent education, family functioning, clinician age, sex beliefs and number of children enrolled in the study, practice structure, % managed care patients, children within practices.
	Child: ECBI, characteristics Family: characteristics, parental distress Professional: recognition of parent-raised concerns/child behaviour problems	Professional reported: 'Are you concerned the child might have any type of psychosocial or developmental problem?'	Multivariable regression	Not reported
	Child: CBCL, characteristics Parent: characteristics, child medical history Professional: -	Professional answered question: 'Does the child have a PsP at this moment?' Mild, moderate and severe problems	Univariable and multilevel multivariable logistic regression	Clustering by physician
	Child: PSC, characteristics Family: characteristics, family functioning Professional: (visit, practice) characteristics	Professional answered question: 'Is there a new, on-going, or recurrent PsP present?'	Multilevel multivariable regression	Clustering by physicians
	Child: CBCL, characteristics Family: characteristics, Professional: (visit, practice) characteristics	Professional rated specific problems on a developed checklist of psychosocial and developmental problems	Multilevel multivariable regression	Clustering by physicians; child's age, race, parents' education

Supplement Table 3a. Continued

Year 1st author Country	Design	Primary Care Setting	Population	Inclusion criteria
2004 Reijneveld (42) NL	Cross-sectional	Youth healthcare without acute care visits	2229 children age 21 months to 4 years	Participating child health care services provided random sample of 150 children excluding children currently being treated for PsP or with missing data
2004 Sayal(21) UK	Nested case-control	General practice	186 children age 5-11 years: matched high and low scorers on hyperactivity items of SDQ	186 matched high and low scorers who visited a participating GP
2005 Reijneveld (43) NL Area deprivation	Cross-sectional	Youth healthcare without acute care visits	4080 children age 4-16 years	Per centre: all children in 3 school classes for 2nd, 4th, 7th (primary school) and 2nd grade (secondary school). Excluding children with incomplete data
2005 Reijneveld (20) NL Ethnicity	Cross-sectional	Youth healthcare without acute care visits	4098 children age 5-15 years	Per centre: all children in 3 school classes for 2nd, 4th, 7th (primary school) and 2nd grade (secondary school). Excluding children with incomplete data or currently being treated for PsP
2005 Zwaanswijk(19) NL	Cross-sectional	General practice	2449 children 4-18 years	Random sample from participating practices

	Factors investigated	Outcome + measure	Analysis*	Analysis additionally adjusted for
	Child: CBCL, characteristics, mental health history Family: characteristics Professional: -	Professional answered question: 'Does the child have a PsP at this moment?'	Multilevel univariable and multilevel multivariable logistic regression	Clustering by physician
	Child: SDQ, characteristics, mental health history Family: characteristics, Professional: parent expressed concern, competency	Professional reported presence of mental health disorders	Multivariable logistic regression	Age, sex, under-privileged area
	Child: CBCL, characteristics, Family: characteristics, area deprivation Professional: -	Professional answered question: 'Does the child have a PsP at this moment?' Only moderate and severe problems	Univariable and multilevel multivariable logistic regression	Levels: child, area, physician; Child age, sex, family structure, parental educational level, employment, ethnic background, CBCL problem scores
	Child: CBCL, characteristics, mental health history Family: characteristics, area deprivation Professional: -	Professional filled out question: 'Does the child have a PsP at this moment?'	Univariable and Multilevel multivariable logistic regression	Clustering by physician; age, parent educational level, family composition, urbanization
	Child: YSR, CBCL, TRF, characteristics Parent: characteristics, Professional: (visit) characteristics	Medical record-based PsP with ICPC-codes P-codes for psychological problems and Z-codes for social problems	Univariable and multivariable logistic regression as no significant cluster effect	Parental MHP, parent education level, type of insurance

Supplement Table 3a. Continued

Year 1st author Country	Design	Primary Care Setting	Population	Inclusion criteria
2006 Martinez (50) UK	Cross-sectional	General practice	98 GP attenders age 13-16 years	Children consecutively visiting 13 GPs excluding patients with incomplete data
2006 Wiefferink (48) NL	RCT on the effect of a structured method training to identify PsP	Youth healthcare without acute care visits	7852 children age 5-6 years	Physicians invited all children from 2 or 3 2nd grade primary school classes. Excluding non-Dutch children, children treated for PsP in past year, missing data on CBCL
2007 Brown(35) US	Cross-sectional analysis of RCT to assess physician training in PsP discussion skills	Youth healthcare and general practice	774 children age 5-16 years	All children visiting participating clinics without considerable pain, excluding children with missing outcome data.
2008 Vogels(47) NL	Cross-sectional	Youth healthcare without acute care visits	3140 children age 8-12 years	Per centre: random sample of children visiting clinic. Excluding children of non-Dutch origin, or currently not under treatment for PsP or with missing data
2009 Klein Velderman (44) NL	Cross-sectional	Youth healthcare without acute care visits	701 children aged 14 months	Participating centres provided a random sample of 100 children excluding without missing data

	Factors investigated	Outcome + measure	Analysis*	Analysis additionally adjusted for
	Child: SDQ, characteristics Parent: characteristics Professional: exploration of psychological issues during visit	GP's reported degree of psychological disturbance on that day on a 5-point scale	Multivariable regression	
	Child: CBCL, characteristics Parent: characteristics, Professional: (visit) characteristics	Professional filled out question: 'Does the child have a PsP at this moment?'	Multilevel multivariable logistic regression	Clustering by physician; other factors in analysis not reported
	Child: SDQ Family: characteristics Professional: (visit) characteristics	Professional answered question: 'Is there a new on-going or recurrent PsP present?'	Multilevel multivariable logistic regression	Clustering by physician, intervention effect
	Child: CBCL, characteristics Family: characteristics Professional: (practice) characteristics	Professional answered question: 'Does the child have a PsP at this moment?'	Univariable and multilevel multivariable logistic regression	Clustering by physician; age, gender, number of parents, educational level, treatment status
	Child: ITSEA, characteristics Family: -characteristics Professional: characteristics	Professionals filled out question: 'Does the child have a PsP at this moment?'	Univariable and multivariable logistic regression as no significant cluster effect	

Supplement Table 3a. Continued

Year 1st author Country	Design	Primary Care Setting	Population	Inclusion criteria
2010 Crone(45) NL	Cross-sectional	Youth healthcare without acute care visits	2392 children age 5-12 years	Participating centres provided a random sample of 100 children visiting clinic. Excluding children with missing data
2010 Richardson (36) US	Cross-sectional	General practice	581 children age 11-17 years	English-speaking children randomly sampled from participating practices without asthma
2012 Dempster (37) US	Cross-sectional	Youth healthcare including acute care visits	831 children age 2-16 years	Patients visiting physician for well-child or acute care visits, excluding patients with missing data
2012 Theunissen (46) NL	Baseline data of RCT on the effect of a structured method training to identify PsP	Youth healthcare without acute care visits	3070 children age 5-6 years	Physicians invited all children from 2 or 3 second grade primary school classes, excluding non-Dutch children, children treated for PsP in past year, missing data on CBCL

	Factors investigated	Outcome + measure	Analysis*	Analysis additionally adjusted for
	Child: CBCL, characteristics Family: -characteristics Professional: characteristics	Professionals filled out question: 'Does the child have a PsP at this moment?'	Multilevel multivariable logistic regression	Clustering by physician; child age, sex, child country of birth, geographic region, family income, parent employment status, education, family situation, parental language, treatment history
	Child: characteristics, mental health history, C-DISC depression and anxiety, moods and feelings questionnaire, Anxiety Sensitivity Index, CBCL Family: -characteristics Professional:-	Medical record-based depression and anxiety diagnoses, related medication, referrals	Univariable and Multivariable logistic regression	
	Child: characteristics, ECBI Family: characteristics, parenting characteristics Professional: (practice) characteristics, professional belief scale	Professional reported concerns about child behavioural or emotional functioning, behavioural or emotional problem treatment, or referral to mental health service.	Multivariable logistic regression	Parental affect, parental self-efficacy, parenting style, older child's age, single parent family
	Child: CBCL, characteristics, ECBI Family: -characteristics, Professional: (practice) characteristics	Professional filled out question: 'Does the child have a PsP at this moment?'	Univariable and multilevel multivariable logistic regression	Preventive paediatrician level

Supplement Table 3a. Continued

Year 1st author Country	Design	Primary Care Setting	Population	Inclusion criteria
2016 Crone (49) NL	Cross-sectional	Youth healthcare without acute care visits	3870 children age 14 months to 12 years	Per centre: random sample of ≥100 children age 14 months – 12 years excluding previously being treated for PsP or with missing data
2016 Mayne(41) US	Cross-sectional analysis of cohort study	Youth healthcare	294 748 children visiting primary care practices age 4-18 years	Child EMR extracted from practices participating in research network, excluding children with epilepsy
2018 Nichols (51) UK	Matched case-control	General practice	98 562 cases and 281 248 controls age 15-24 years	Child EMR extracted from practices participating in research network Cases: children age 15-24 years with incident first depression, excluding prior depression. Cases: no depression until index date of matched case

[a] Mental health problems (MHP) and psychosocial problems (PsP) refer to the same concept, terms used refer to the wording used in the specific studies

*Only results additional to the results of Horwitz et al 1998 (40) are presented, as similar studies,

** Only results additional to the results of Kelleher et al 1999 (38) are presented, as similar studies

CBCL = Child behaviour checklist, C-disc = computerized diagnostic interview schedule for children, ECBI = Eyberg child behaviour inventory,

	Factors investigated	Outcome + measure	Analysis*	Analysis additionally adjusted for
	Child: CBCL, characteristics Family: -characteristics Professional: (visit) characteristics	Professionals filled out question: 'Does the child have a PsP at this moment?'	Univariable and multilevel multivariable logistic regression	Other parent, child, environmental stressors and child, family and PCP characteristics
	Child: characteristics Family: characteristics, Professional: (practice) characteristics	Medical record-based mental health problem diagnosis or related medication	Multilevel multivariable logistic regression	Gender, age, child within practice
	Child: characteristics Family: -characteristics	Medical record-based first recorded depression diagnosis	Multivariable logistic regression	

EMR = electronic medical record, ITSEA = Infant toddler social and emotional assessment, MHP = mental health problem, NA = not applicable, NL = the Netherlands, PCP = primary care professional, PsP = psychosocial problems, PR = Puerto Rico, PSC = Paediatric symptom checklist, RCT = randomized controlled trial, SDQ = Strengths and difficulties questionnaire, TRF = Teacher's report form, UK = United Kingdom, US = United States, YSR = Youth self-report

Supplement Table 3b. Characteristics of included studies – Mental health problem (MHP) prevalences and study results[a, b]

Year 1st author Country	Prevalence MHP based on tool	Prevalence MHP physician reported	% children of 'correctly' identified by physician[c]
1992 **Horwitz(31)** **US[*, $]**		27.3%	
1997 Kelleher(32) US, PR, Canada[¨]	12%		54%
1997 **Lynch(39)** **US[$]**	20%		
1998 Horwitz(40) US		27.5%	
1999 Kelleher(38) **US, PR, Canada**			57%
1999 Wildman (22) **US**	13%		50%

	Positive association with identified mental health problems OR/RR (when reported with 95% CI)	**Negative association with identified mental health problems OR/RR (when reported with 95% CI)**	**No association with identified mental health problems**
	Unmarried parents RR 1.73		Frequent healthcare user in past year, Child ethnicity, Practice type
			Rural practice *Season of visit*
	Parent initiated disclosure of PsP (observer reported) RR 3.64 (1.48-8.90)		Parent checklist to prompt parent PsP disclosure during visit
	Older maternal age OR 1.41 Poor parent mental health status OR 1.55 Male child OR 1.7 Well-child visit OR 3.03 Child well-known to clinician OR 1.82	Poverty OR 0.61 Child severe medical problem OR 0.79	Caregivers reported discussion of PsP with physician
	Ethnicity Hispanic American OR 0.55 *Age 8-11 OR 1.75* *Age 12-15 OR 1.77* *Male child OR 1.72* *PSC-score OR 1.09* *Child well-known to clinician OR 5.25* *Well child visit OR 1.32* *Psychosocial problem visit OR 19.7*	*Commercial insurance OR 0.72*	*Ethnicity African American* *One-parent household*
	Physician reported parental disclosure of PsP OR 3.22		Parental distress ECBI scores

Supplement Table 3b. Continued

Year 1st author Country	Prevalence MHP based on tool	Prevalence MHP physician reported	% children of 'correctly' identified by physician[c]
2001 Brugman (23) NL	8.8%	25%	57%
2001 Scholle (33) US, PR, Canada		19.0%	

	Positive association with identified mental health problems OR/RR (when reported with 95% CI)	**Negative association with identified mental health problems OR/RR (when reported with 95% CI)**	**No association with identified mental health problems**
	Clinical CBCL Internalizing score OR 2.49 (1.90-3.28) Clinical CBCL Externalizing score OR 1.93 (1.48-2.53) Very highly urbanized area OR 1.34 (1.01-1.77) Past psychological treatment PsP OR 2.21 (1.56-3.12) Past medical treatment PsP OR 4.67 (3.43-6.35) Past other treatment PsP OR 2.65 (1.81-3.90) Life event past year OR 1.55 (1.30-1.85) Parent reported academic problems OR 2.28 (1.84-2.83)	Age 12-16 OR 0.58 (0.42-0.81)	Child gender, Ethnicity One-parent family No siblings Parental educational level Parent employment status, Parent reported physical illness/handicap)
	Higher child age OR 1.02 Male child OR 1.46 Not living with married parents OR 1.52 PSC Internalizing symptoms OR 1.13 PSC Externalizing symptoms OR 1.04 Psychosocial visit OR 22.2 Child well-known to clinician OR 1.69 Longer duration of visit OR1.45	Ethnicity Black OR 0.61 Ethnicity Hispanic OR 0.66 Commercial insurance OR 0.77 Physician belief (not specified) OR 0.96 Better family functioning OR 0.70	Parent education, Physician age, Physician gender Year completed training, Special fellowship/ rotation High % managed care patients Availability on-site mental health service Season of the year

Supplement Table 3b. Continued

Year 1st author Country	Prevalence MHP based on tool	Prevalence MHP physician reported	% children of 'correctly' identified by physician[c]
2004 **Leaf(34)** **US**	13.9%	27.9%	
2004 Reijneveld (42) NL	6.1%	9.4%	29.4%
2004 **Sayal(21) UK**	23%	11%	26%

	Positive association with identified mental health problems OR/RR (when reported with 95% CI)	**Negative association with identified mental health problems OR/RR (when reported with 95% CI)**	**No association with identified mental health problems**
	Male child OR 1.65 (1.31-2.07) Unmarried parents OR 1.76 (1.23-2.52) Clinical CBCL total score OR 3.70 (2.83-4.85) Preventive care visit OR 2.54 (1.96-3.29) Interaction effect between paediatricians' training and paediatricians' familiarity: No training/know moderate-well OR 2.78 (1.93-3.99) Some training/not know well OR 2.96 (1.45-6.03) Some training/Know moderate-well OR 3.33 (1.78-6.21) Advanced training/Not know well OR 3.55 (1.49-8.45) Advanced training/Know moderate-well OR 5.39 (2.69-10.78) *Advanced training X2 10.78*		Having a medical condition Paediatrician's age, gender, years in practice; size, composition and type of practice
	Higher age OR 1.68 (1.09-2.60) One-parent family OR 3.20 (1.63-6.27) Past psychological treatment PsP OR 8.78 (3.72-20.76) Past medical treatment PsP OR 8.58 (3.72-20.76) Clinical CBCL total problems score OR 3.43 (2.04-5.75) Clinical CBCL externalizing problems score OR 4.88 (2.93-8.14)	Medium/high parental educational level OR 0.54 (0.37-0.80) Day care OR 0.54 (0.34-0.85)	Child gender, Ethnicity, No. siblings, Parental employment, Very highly urbanized, Pregnancy duration <37 wks, Artificial delivery, Birth weight <2500g, Hospitalization after birth, Second and older child, Clinical CBCL internalizing problem score, Past other treatment PsP, Life event in past year, Parent report of physical illness/handicap
	Parental perception of difficulties on SDQ OR 11.6 (2.4-56.2) GP reported parental expression of concern OR 247.1 (26.1-2340.8)		

Supplement Table 3b. Continued

Year 1st author Country	Prevalence MHP based on tool	Prevalence MHP physician reported	% children of 'correctly' identified by physician[c]
2005 Reijneveld (43) NL	8.5%	10.1%	
2005 Reijneveld (20) NL Ethnicity	8.5%	22.2%	
2005 Zwaanswijk (19) NL	4-11 years 20.4%, 12-17 years 14.3%	4-11 years 7.1%, 12-17 years old: 6.7%	
2006 Martinez (50) UK	32%	30%	61.2%
2006 Wiefferink (48) NL	7%	27.1 %	54.9%

	Positive association with identified mental health problems OR/RR (when reported with 95% CI)		Negative association with identified mental health problems OR/RR (when reported with 95% CI)	No association with identified mental health problems
	Moderately deprived area OR 1.39 (1.03-1.87) Most deprived area OR 1.76 (1.30-2.38)			
	Ethnicity economic immigrants (vs. Dutch) OR 1.62 (1.01-2.60)			Ethnicity former colonies/ other non-industrialized/ other industrialized
	<u>Age 4-11 years:</u> Male child OR 2.2 (1.1-4.6) Clinical CBCL total problem score OR 2.5 (1.3-5.1) Teacher report PsP OR 3.0 (1.5-6.1)	<u>Age 12-17 years:</u> General impression of health OR 6.9 (3.2-15.1) Clinical CBCL total problem score OR 5.0 (2.1-12.2)		Child chronic physical disorders <u>Age 4-11 years:</u> General impression of child health, <u>Age 12-17 years:</u> Child gender
	Physician reported exploration of PsP OR 11.13 (2.78-44.53) Child reported SDQ score (some need vs. low need) OR 4.37 (1.02-18.74) Child reported SDQ score (high need vs. low need) OR 11.22 (2.92-43.12)			Child gender, age, history of family MHP, parent/ adolescent perceived difficulties
	Physician training 3 months ago vs. no training OR 3.7 (1.2-11.8) *Physician training 3 months ago vs. no training OR 3.7 (1.2-11.8) for moderate and severe PsP*			Physician training 6 months ago vs. training 3 months ago *Physician training 3 months ago vs. no training for mild, moderate and severe PsP*

Supplement Table 3b. Continued

Year 1st author Country	Prevalence MHP based on tool	Prevalence MHP physician reported	% children of 'correctly' identified by physician[c]
2007 **Brown(35) US**	42.3%	48.4%	
2008 **Vogels(47)** **NL**		20.7%	
2009 **Klein Velderman (44) NL**	11.1%	7.6%	27%

	Positive association with identified mental health problems OR/RR (when reported with 95% CI)	**Negative association with identified mental health problems OR/RR (when reported with 95% CI)**	**No association with identified mental health problems**
	Parent reported PsP discussion OR 3.67 (2.29-6.11) Visit PsP OR 2.16 (1.08-4.3) SDQ burden to family OR 2.03 (1.26-3.25) Positive SDQ OR 2.47 (1.57-3.90) Higher age OR 1.11 (1.05-1.25) Mental health service use OR 3.22 (1.99-5.26) Lower physician believed burden OR 1.66 (1.23-2.20) *Higher physician believed burden: wrongly identified children*	Private insurance OR 0.65 (0.42-0.97) Easily consulted PsP related specialists OR 0.54 (0.39-0.76) *Higher physician believed burden: correctly identified children*	Child's ethnicity, parent distress, number of previous visits, visit not for PsP, physician specialty (GP vs. paediatrician), job satisfaction, job control, confidence in PsP treatment and referral skills, intervention of physician training
	Clinical CBCL total problem score OR 1.05 (1.04-1.05) One-parent family OR 2.39 (1.76-3.25) Past treatment PsP OR 2.18 (1.70-2.83)	Higher age OR 0.83 (0.74-0.92) Female child OR 0.70 (0.58-0.85) Medium education OR 0.53 (0.32-0.88) High education OR 0.43 (0.25-0.72)	
	Clinical ITSEA total problem score OR 5.78 (2.89-11.55) Clinical Internalizing ITSEA score OR 3.16 (1.50-6.66) Past/current professional care PsP OR 3.93 (1.59-9.70)		Child gender, Ethnicity, No siblings, Deprived households, Parental educational level Negative pregnancy outcome (pregnancy duration <37 weeks/ birth weight <2500g), Instrumental delivery, Life events past year, Parent report chronic illness/handicap, Clinical Externalizing ITSEA score

Supplement Table 3b. Continued

Year 1st author Country	Prevalence MHP based on tool	Prevalence MHP physician reported	% children of 'correctly' identified by physician[c]
2010 Crone(45) NL	~4.9%	~21.16%	60% of children with industrialized background and 30% with Turkish/ Moroccan background
2010 Richardson (36) US	8.5%		22%
2012 Dempster (37) US		13.8%	
2012 Theunissen (46) NL	9.3%	26.2%	57.7%

	Positive association with identified mental health problems OR/RR (when reported with 95% CI)	**Negative association with identified mental health problems OR/RR (when reported with 95% CI)**	**No association with identified mental health problems**
	Vs. normal CBCL total problem score and ethnicity industrialized: -Elevated CBCL total problem score and ethnicity industrialized OR 5.22 (3.01-9.06) -Elevated CBCL total problem score and ethnicity Surinamese/Antillean OR 6.68 (1.56-28.67) -Elevated CBCL total problem score and ethnicity other non-industrialized country OR 6.39 (1.34-30.54)		Child Ethnicity *Parental concerns*
	Higher depressive and anxiety symptom score tools OR 1.19 (1.03-1.38) More primary care visits OR 2.36 (1.16-4.81)		Child age, Child gender, Mean income, Anxiety disorder based on C-DISC, Child-perceived psychosocial impairment Internalizing CBCL score Externalizing CBCL score
	Higher age child OR 1.27 (1.19-1.36) Higher ECBI OR 1.03 (1.02-1.04)	Parent over reactive parenting style OR 0.93 (0.88-0.98)	One-parent status, Insurance, Parent affect, Parent lax parenting style, Parenting sense of competence
	Elevated CBCL score OR 5.09 (3.90-6.65) *More use of CBCL OR 3.04 (1.13-8.20)*	Physician work experience >21 years OR 0.37 (0.17-0.84) Always/on indication use of CBCL OR 0.25 (0.11-0.54) Female child OR 0.56 (0.47-0.67) Medium parental educational level OR 0.64 (0.53-0.79) High parental educational level OR 0.54 (0.42-0.68)	Physician age Work experience < 21 years Always/on indication use of LSPPK Always/on indication use of TRF *Less us of the TRF* *Physician work experience*

Supplement Table 3b. Continued

Year 1st author Country	Prevalence MHP based on tool	Prevalence MHP physician reported	% children of 'correctly' identified by physician[c]
2016 Crone (49) NL	4.7%	17.5%	47.2%
2016 Mayne(41) US		15%	

	Positive association with identified mental health problems OR/RR (when reported with 95% CI)	Negative association with identified mental health problems OR/RR (when reported with 95% CI)	No association with identified mental health problems
	Clinical CBCL/ITSEA score OR 3.43 (2.41-4.89) Child history of problems OR 5.85 (4.75-7.21 Lower parenting efficacy OR 1.28 (1.05-1.56) Male child OR 1.21 (1.02-1.43) Age 8-12 years (vs. 14 months) OR 1.61 (1..00-2.58) Physician used screening instruments on indication (vs. never) OR 1.53 (1.10-2.14) Stressors in child, not in parenting/context OR 6.20 (4.72-8.13) Stressors both in child and parenting/ context OR 7.84 (5.85-10.51) Child psychiatrist unavailable in community OR 1.40 (1.09-1.80)	Average educational level OR 0.72 (0.59-0.88) High educational level OR 0.70 (0.53-0.91)	Ethnicity Life events Average educational level Physician always used screening instrument (vs. never) Stressors in parenting/ context, not in child
			Co-located MH provider present Higher foster care prevalence

Supplement Table 3b. Continued

Year 1st author Country	Prevalence MHP based on tool	Prevalence MHP physician reported	% children of 'correctly' identified by physician[c]
2018 **Nichols (51) UK**			

Positive association with identified mental health problems OR/RR (when reported with 95% CI)			Negative association with identified mental health problems OR/RR (when reported with 95% CI)	No association with identified mental health problems
Factor:	Boys:	Girls:		Weight loss, excessive sweating, diabetes, epilepsy, asthma, alcohol misuse, neonatal health problems, developmental delay, work stress
Most deprived area	OR 1.56 (1.35-1.80)	OR 1.35 (1.23-1.47)		
Smoker	OR 1.88 (1.66-2.11)	OR 1.35 (1.27-1.44)		
Anxiety	OR 6.03 (4.49-8.09)	OR 3.26 (2.78-3.82)		
Low mood	OR 10.25 (7.38-14.23)	OR 5.49 (4.79-6.31)		
Tiredness	OR 3.10 (2.03-4.73)	OR 2.02 (1.72-2.37)		
Little sleep	OR 4.27 (2.40-7.62)	OR 2.51 (1.81-3.48)		
Bed wetting	OR 2.98 (1.56-5.70)	-		
Eating disorder	-	OR 2.30 (1.83-2.89)		
Self-harm	OR 8.22 (4.92-13.73)	OR 3.38 (2.81-4.06)		
Headache	OR 2.30 (1.99-2.67)	OR 1.75 (1.63-1.88)		
Dyspepsia	OR 1.74 (1.44-2.11)	OR 1.50 (1.37-1.64)		
Abdominal pain	-	OR 1.32 (1.19-1.46)		
Back pain	OR1.47 (1.23-1.75)	OR 1.29 (1.17-1.41)		
More visits past year	OR 1.17 (1.15-1.19)	OR 1.11 (1.10-1.12)		
Drug misuse	OR 2.51 (1.43-4.37)	-		
School problems	OR 5.84 (3.51-9.71)	OR 2.04 (1.52-2.73)		
Loss in family	OR 2.93 (1.59-5.38)	OR 2.24 (1.66-3.01)		
Abuse/ neglect	OR 1.64 (1.16-2.30)	OR 1.57 (1.30-1.89)		
Social services involved	OR 4.89 (1.79-13.35)	-		
OCD	OR 13.98 (7.07-27.66)	OR 8.57 (5.24-14.03)		
PTSS	-	OR 3.33 (1.66-6.70)		

Supplement Table 3b. Continued

[a] *Results in italics refer to factors associated with the identification of children with an elevated score on mental health problem assessment tools* [b] Mental health problems and psychosocial problems refer to the same concept, terms used refer to the wording used in the specific studies, factors are depicted as used in the specific studies. [c] 'Correctly' identified refers to the identification of children with an elevated score on MHP assessment tools. [$] = only results from univariable regression analysis, *Only results additional to the results of Horwitz et al 1998(40) are presented, as similar studies,

**Only results additional to the results of Kelleher et al 1999 (38) are presented, as similar studies; CBCL = Child behaviour checklist, C-disc = computerized diagnostic interview schedule for children, ECBI = Eyberg child behaviour inventory, GP = general practitioner, ITSEA = Infant toddler social and emotional assessment, NL = the Netherlands, OCD = obsessive compulsive disorder, OR = odds ratio, PsP = psychosocial problems, PTSS = post-traumatic stress disorder, PR = Puerto Rico, PSC = Paediatric symptom checklist, RR = relative risk, SDQ = Strengths and difficulties questionnaire, TRF = Teacher's report form UK = United Kingdom, US = United States, X2 = chi square, YSR = Youth self-report, 95% CI = 95% confidence interval