Mathews, F., Newlove-Delgado, T., Finning, K., Boyle, C., Hayes, R., Johnstone, P., & Ford, T. (2020). Teachers concerns about pupil's mental health in a cross-sectional survey of a population sample of British school-children. *Child and Adolescent Mental Health.* Published online first. http://dx.doi.org/10.1111/camh.12390

Teachers concerns about pupil's mental health in a cross-sectional survey of a population sample of British school-children

Frances Mathews[1]

Tamsin Newlove-Delgado[1]

Katie Finning[1]

Christopher Boyle[2]

Rachel Hayes[1]

Patrick Johnston[3]

Tamsin Ford[4]*

1. University of Exeter College of Medicine and Health, College House, St Luke's Campus, Exeter EX1 2LU
2. Graduate School of Education, University of Exeter
3. Place2Be
4. University of Cambridge, Department of Psychiatry, Douglas House, 18b Trumpington Road, Cambridge CB28AH

Abbreviated title: Accuracy of teacher concern for pupil mental health: survey British school children

Ethical information

UEMS ethics committee provided ethical approval for the secondary analysis of 2004 British Child and Adolescent Mental Health Survey. Medical Research Ethics Committee provided ethical approval for the original survey in 2004. All participants provided informed consent.

Conflicts of interest

Tamsin Ford has a voluntary position as the Research Chair for Place2Be, which involves sitting on the Research Advisory Group and contributing to research projects. She receives no personal payment other than reimbursement of travel expenses. Place2Be provide funding to her research team to support Place2Be related research projects.

Abstract

Background

Schools are becoming central to the identification and referral of children and young people with poor mental health. Understanding how well a teacher concern predicts mental disorder in a child or young person is important for mental health teams who need to respond to referrals.

Method

This secondary analysis of the 2004 British Child and Adolescent Mental Health Survey used the first item of the Strengths and Difficulties Questionnaire (SDQ) Impact subscale to indicate concern about a child or young person's mental health. Mental disorder according to DSM IVR criteria was assessed using the multi-informant Development and Well-Being Assessment. We compared the proportion with and without mental disorder according to the presence or absence of teacher concern.

Results

Teacher concern was moderately predictive (49% with teacher concern had a disorder) and sensitive (teacher concern present among 56% with disorder), while lack of teacher concern was highly predictive (only 5% had disorder) and specific (94% no disorder). Teacher concern was associated with significantly poorer mental health (mean teacher SDQ total difficulties score 19.6, SD 5.6 with disorder, mean 15.0; SD 5.1 if no disorder) compared to children without teacher concern (mean 9.6, SD 5.5 with disorder, and 4.9; SD 4.3 if no disorder; $F(3, 5931) = 1527.228$, $p=0.001$). If both teacher and parents were concerned, the child or young person was much more likely to have a disorder.

Conclusion

A lack of teacher concern can reassure mental health practitioners in the vast majority of cases. While teacher concern does identify those with poorer mental health, it is only moderately predictive of a disorder. When concerned about a child or young person, discussions with parents or others who know them may help teachers identify those who most need support.

Key message

- The emphasis on schools as a major setting to provide support and identify the need for referral to specialist mental health services means service commissioners, providers and practitioners could benefit from insight into how predictive a teacher's concern is of childhood mental health conditions and how this may vary with the type of disorder
- If teachers are not concerned about a child, practitioners can be reassured that there is unlikely to be a significant problem with their mental health, although this will be less certain in schools whose pupils are likely to have a higher than average levels of difficulty
- Teacher concerns do not necessarily differentiate between clinically impairing and mild / moderate mental health difficulties, but do identify children in poorer mental health
- Asking for corroboration of concern from other sources increases the strength of the association to severe mental health disorders

Key words

Teacher; Child; Adolescent; Mental Health; Schools; Mental Disorder

Recent worldwide research shows 13% of children and young people of compulsory school age have a mental health disorder, (Polanczyk *et al*, 2015). Whilst UK findings report one in eight, only about a quarter of these children and young people access mental health services (Green *et* al, 2005; Mandalia *et* al, 2018). On average, approximately a quarter of referrals to specialist services are rejected or redirected in the UK, with the figure in some areas being as high as 64% (Frith, 2017). In many countries, teachers are the most commonly consulted service in relation to child mental health, so schools have a key role in the identification of mental health conditions in their pupils (Ford et al, 2007; Mental Health Taskforce, 2016; Newlove-Delgado *et al*, 2015; Sadler *et al*, 2018). In the UK, a recent Green paper proposed the development of school-based mental health teams to link the Child and Adolescent Mental Health Services (CAMHS) to schools, and recommended that all schools have a designated mental health lead to identify children and young people who are struggling (Department of Health and Social Care & Department for Education, 2017). The ultimate aim is to increase access to early intervention for those with mild to moderate mental health needs, as well as timely referral to those with more severe problems (Department of Health and Social Care & Department for Education, 2017).

Understanding how teacher concern reflects clinically impairing mental health conditions in children and young people and how this may vary with different types of disorder, is important for mental health practitioners who receive and triage referrals from schools, and for those training and managing the education staff who will be taking up these new roles. We explored these questions using data from the 2004 British Child and Adolescent Mental Health Survey (BCAMHS), (Green *et al*, 2005). Specifically, we used the first question of the Strength and Difficulties Questionnaire (SDQ) impact supplement (Goodman et al., 2000; www.sdqinfo.com) to indicate concern about mental health and analysed the presence or absence of concern in relation to the presence of absence of a clinically impairing mental disorder assessed by multi-informant diagnostic assessment.

Method

The University of Exeter College of Medicine and Health ethics committee provided approval for the secondary analysis of these data, while the original survey gained approval from the Medical Research Ethics Committee.

The 2004 British Child and Adolescent Mental Health survey recruited 7977 children and young people aged 5 to 16 years from England, Scotland and Wales in a stratified probability sample using the then universal child benefit register as a sample frame (Green *et al*, 2005). Mental health was assessed using the Development and Well-being Assessment (DAWBA), which combines highly structured questions about a range of common childhood mental disorders with semi-structured probes about any areas of reported difficulty (Goodman *et al*, 2000). The DAWBA was completed in full by the parents of all participating children included in the study. Young people aged 11-16 were invited to complete the DAWBA, and if the family agreed, a teacher was mailed a briefer questionnaire. A small team of expert clinical raters who were blind to the SDQ data, reviewed all data from all informants to assign DSM IV psychiatric diagnoses (American Psychiatric Association, 1994). Teachers, parents and young people aged 11 years or older also completed the Strength and Difficulties Questionnaire (SDQ) which is a brief, reliable, validated and widely used dimensional measure of childhood psychopathology (Goodman, 1999). The first question of the Impact supplement was used to assess the level of teacher or parental concern about the child (Goodman, 1999). This asks respondents if they consider the child to have difficulties in the following areas: emotions, concentration, behaviour or being able to get on with others, to which respondents could rate difficulties as 'no', 'minor', 'definite' or 'severe', (Goodman, 1999). The latter two responses were categorised as indicating concern and the former were assumed to indicate no significant concern. Parents reported demographic characteristics, their child's health and access to services over the previous 12 months. Parental mental health was assessed using the General Health Questionnaire, and family function using the McMaster's family Assessment Device (Goldberg *et al,* 1997; Miller *et al,* 1985).

SPSS statistics version 25.0 was used to conduct our analysis. Those children and young people without a teacher report were removed, leaving 5965 cases to analyse. We excluded the self-report SDQ from this analysis because it was only available on those over the age of 11, so would provide imprecise estimates, particularly for the type of disorders. In addition, previous work suggests that parent and teacher reports are more predictive of disorder (Goodman, Ford, Simmons *et al*, 2003). Those with and without teacher data were compared for all available background characteristics using chi-squared and t-tests (significance level p=0.05) to consider the impact of missing teacher data on our analysis. Based on the similarity between both studies, values of Sensitivity and Specificity (as defined in Table 1) from this study, and prevalence data from the recent UK national survey will calculate positive predictive value (PPV) and negative predictive value (NPV) (as defined in Table 1) parameters to understand how generalisable our findings for those with teacher reports are to populations with a different prevalence, Mandalia *et* al, 2018)

Insert Table 1 here

Data on the children and young people were analysed separately by Primary (5 – 10 years) and Secondary (11-16), and by all ages. We estimated the prevalence, PPV, NPV, Sensitivity and Specificity to identify differences in teacher concern by school age and disorder type.

A one-way ANOVA was used to compare teacher and parent SDQ total difficulty mean scores for four possible categories of diagnosis of a mental disorder (no disorder and no concern, disorder but no concern, no disorder but concern, disorder and concern). We analysed teacher and parent concern in relation to disorder separately.

Finally, we calculated the PPV and NPV, sensitivity and specificity when both teacher and parent had a concern, only a teacher, or only a parent had a concern, in relation to the presence or absence of a mental disorder (Prince, 2003).

Each analysis considered the presence of any mental disorder, more than one disorder (comorbidity), emotional disorder (anxiety or depression), Attention Deficit Hyperactivity Disorder (ADHD) or conduct disorder. Less common disorders, such as tic and eating disorders are only analysed when included in the "any mental disorder" category owing to small numbers.

Results

The sample of children that we could not include in this analysis due to missing teacher data had poorer mental health according to the parental SDQ, but importantly were not more likely to have a mental disorder (see on-line supplementary Tables A and B). They were more likely to be living in challenging circumstances (poorer parental mental health, large, single or reconstituted families, economic deprivation, more stressful life events and of black of ethnic minority status). They were in poorer physical health and were more likely to have a learning disability or contact with mental health services or educational specialists. The NPV of those with missing teacher information would not be generalisable to those with a teacher report were it possible to calculate it, as NPV is dependent on the prevalence of the condition under study. Current prevalence rates of mental health disorders in children and young people increases teacher concern PPV to 56.7 and decrease NPV to 93.6 parameters (see on-line supplementary Table C).

The NPV and Specificity of teacher concern were high for the whole sample as well as both Primary and Secondary school-aged children, which suggests that mental health practitioners can be reassured by a lack of teacher concern (see Table 2). In the sample as a whole, teachers' concerns were more sensitive to conduct disorder and ADHD, than emotional disorder, which may have fewer symptoms that are visible in the school setting. They were also more sensitive to children with more than one mental health condition (comorbidity), which probably relates to the increased impairment experienced by these children. A similar but less striking trend was evident for the PPV in primary age children, while teachers' concerns about ADHD among secondary aged pupils were less predictive than their concerns about emotional disorders.

Insert Table 2 here

As Figure 1 illustrates, distress according to the SDQ, was highest for those with both a disorder and adult concern and lowest for those with no disorder and no concern regardless of whether the teacher or parent was reporting. Both the intermediate groups had intermediate levels of distress, but parental SDQ scores were more likely to reflect disorder rather than the level of parental concern, whilst teacher SDQ scores were lower for those with a disorder who the teacher thought were coping compared to significantly higher scores for those without disorder who the teacher was concerned about. This may be a true reflection of their function in the school setting, as not all disorders may cause problems coping with school. Overall, a statistically significant difference was found between the different groups related to the presence or absence of teacher concern and disorder for both the teacher SDQ total difficulty scores mean ($F(3, 5931) = 1527.228$, $p=0.001$) and parental SDQ total difficulty scores mean value ($F(3, 5931) = 719{,}894$, $p=0.001$). Importantly, children for whom there was teacher concern but no mental disorder had considerably worse mental health than their peers for whom teachers reported no worries (mean teacher SDQ total difficulties score 15.0, standard deviation 5.1 versus mean 4.9, SD 4.3).

Insert figure 1

When reports of concern from both teachers and parents were combined, they produced higher levels of sensitivity across all disorders compared to teacher or parent only reports, with the exception of parent only concern for emotional disorder. Specificity for any psychiatric diagnosis was almost twice as high when both teacher and parent were concerned (see Table 3).

Insert table 3 here

Discussion

To our knowledge this is the first paper to examine how accurately teacher concern predicts mental disorder in school-aged children and young people. Our findings replicate a similar analysis of parental concern that used data from the earlier 1999 British Child and Adolescent Mental Health Survey (Ford *et al*, 2005). The latter study found that the accuracy of parental concern prediction was increased by checking whether the teacher was also worried, which

mirrored the findings from the current analysis; higher sensitivity of teacher concern when corroborated by parental concern. This previous survey also demonstrated that the children and young people for whom parents were concerned but did not meet diagnostic criteria for a mental disorder, had significantly poorer mental health, as demonstrated by elevated SDQ total difficulty scores, compared to the children and young people who parents were not worried about them (Ford *et al*, 2005). Thus, if the parents or carers decline requests for contact with teachers, practitioners can be reassured if parents lack concern that the vast majority of children will be in good mental health, but will need more information to assess if concerns relate to clinically impairing mental health conditions or subclinical difficulties (Ford et al., 2005). The effect of a lack of a teacher report warrants further investigation as the practical benefits of multi-informant assessments may improve access to services, (Collishaw *et al*, 2009; Mandalia *et* al, 2018 McNeilis *et al*, 2018).

Our findings support previous literature that teacher and parents do not always have the same perspectives in their assessment of mental health, reflected in the teacher SDQ total difficulties scores which relate to the level of teacher concern more closely than parental concern (Collishaw *et al*, 2009; De Los Reyes *et al,* 2015). Poor levels of agreement between informants about the same child are common and likely to be related to true differences in how the child functions in relation to different environments, the informants' different frames of reference and measurement error (Collishaw *et al*, 2009; De Los Reyes *et al,* 2015). Parents are likely to be predominantly influenced by family distress and child physical health while teachers' concerns will reflect their broader experience of the normal range of child behaviour in the school context, including peer relationships, child attainment and economic disadvantages of school and surrounding neighbourhood (Collishaw *et al*, 2009). Attempts to develop a disorder specific hierarchy of informant perspectives, usually in a research context, have proved unhelpful, but careful clinical review of all the information from all informants improves diagnostic assessment (McNeilis *et al,* 2018).

Universal screening programmes have not been extensively tested, but may arguably be the most accurate method of identifying children and young people with mental health disorders

(Anderson et al, 2018; Goodman et al., 2003). Our findings reinforce the concern that universal screening programmes would yield a high number of false-positive results, particularly if solely reliant on teacher accounts. If the objective is to identify disorder, teacher concerns do not necessarily differentiate between severe, moderate and milder mental health difficulties (Anderson *et al,* 2018). Better differentiation about the severity of difficulties and the threshold for referral to specialist services is important to avoid swamping specialist services, as is the adequate provision of support for those with mild or moderate mental health problems to prevent deterioration. The latter is particularly important in the school context, where poor mental health can impede children's ability to function in school and because schools are, by default, the front-line service provider for child mental health (Ford *et al*, 2007; Newlove-Delgado *et al,* 2015).

While informative, our study raised additional research questions. The current analysis was cross sectional, and it would be useful to understand more about the future mental health trajectory with children with mild, moderate, and severe mental health difficulties in order to understand better how to target resources. In addition, it would be helpful to understand how predictive teacher and parental concerns are of persistent difficulties. The impact of training programmes on mental health in initial teacher training and for the new designated mental health leads in schools, could potentially increase the accuracy of the recognition of more severe problems but would need testing empirically (Department of Health and Social Care & Department for Education, 2017; Mental Health Taskforce, 2016). Monitoring the effect that teams in schools have in supporting low level mental health problems is important, and may provide data that support more accurate identification of need (Department of Health and Social Care & Department for Education, 2017; Mental Health Taskforce, 2016; Newlove-Delgado *et al*, 2015). Analysis so far has not explored how predictive young people's concerns are in detail, though Goodman's initial work suggests that young people were less predictive than either parent or teacher (Goodman *et al,* 2003).

Our analysis benefits from a large representative population-based sample of children and the use of validated measures to assess mental health (Goodman, 1999; Goodman *et al*, 2000; Green *et* al, 2005). Overall, characteristics of those with a mental disorder identified here,

irrespective of having a teacher report, are the same as those described in recent literature (Department of Health and Social Care & Department for Education, 2017; Mandalia *et al,* 2018; Green *et al*, 2005; Mental Health Taskforce, 2016) However, not all families consented to contact with a teacher, and not all teachers responded to the survey, which reduced the sample for analysis to almost 75% of the entire baseline sample (Green *et al*, 2005). Our analysis shows that children and young people without teacher data were in poorer mental health and facing higher levels of adversity than the children we were able to include. This might therefore have reduced the estimated sensitivity and PPV of teacher concern. However, emerging evidence suggests that socio-demographic, economic and family factors, such as living in a one-parent family, may increase the level of disagreement between parents and teachers; a reporting bias that would operate in the opposite direction (Cheng *et al,* 2018). In addition, previous research shows that whilst those with poorer mental health tend to be less likely to participate and more likely to drop out of studies, this does not necessarily change the nature of associations detected in the obtained sample (Wolke et al, 2009).

Secondary analysis is inevitably restricted to the available data, which means that we lacked data in the under 5's and the over 16's, so our results may not generalise to nurseries and further education (Sadler *et al,* 2018). It is worth also noting that NPV and PPV are both dependent on the prevalence of the condition under study, so that in schools with particularly high levels of need (for example alternative provision or schools in highly deprived areas), a lack of teacher concern may be less reassuring and the presence of teacher concern more predictive (Samet et al., 2009). None-the-less, in our sensitivity analysis, PPV and NPV figures altered only marginally (see on-line supplementary Table C) (Green *et* al, 2005; Mandalia *et* al, 2018). Further adjustments in PPV and NPV of teacher concern may also be impacted by the quality or availability of mental health training received as teachers report the need for additional training and support (Evans *et al*, 2019).

We have no information about the detail of teacher's concerns, which we are inferring from their response to the SDQ (Green *et al*, 2005). The number of children with specific diagnoses, such as separation anxiety, were too few to permit meaningful analysis, so we analysed across broad

groups of disorder (emotional disorder). This may have missed some differences that may relate both the pattern of prevalence (e.g. separation anxiety is common in very young children, panic attacks are rare before adolescence), and their salience to the school context (social anxiety can be reflected in an unwillingness to speak in class, while phobias that do not involve school-based stimuli may never cause problems in school) (Collishaw *et al,* 2009; De Los Reyes *et al*, 2015). The latter, in combination with the issue that some of the less common disorders, such as tic and eating disorders, if not comorbid with other disorders that impact function at school, might contribute to the surprisingly weak relationships between teacher and parent concern and mental disorder.

Conclusion

Teacher concern is only moderately predictive of clinically diagnosable mental health disorders but does identify children and young people who are more distressed than those without disorder or concern. Lack of teacher concern should reassure mental health practitioners in the vast majority of cases, while asking parents or other informants who know the child for their opinion may help to identify those who most need support.

Acknowledgements

We would like to thank the children, their parents and their teachers who participated in this survey, as well as our colleagues on the steering groups, as well as the England's Department of Health, the Welsh Assembly and Scottish Office who commissioned the survey, and the Office for National Statistics who led the data collection. The input of Robert Goodman in this work was essential. He led the team of clinical raters as well as designing both the mental health measures. We are also grateful to Darren Moore, lecturer in Education at the University of Exeter for his helpful comments on an early draft. Finally, we would like to thank Sarah Golden at Place2Be; our conversation about children who appear to have no difficulties at referral sparked this analysis.

Study funding

Frances Mathews time was funded by Place2Be via Exeter University College of Medicine Tamsin Ford has a voluntary position as the Research Chair for Place2Be. The initial survey was funded by the governments of England, Wales and Scotland. The funders had no influence on the design, analysis or reporting of this study.

Author's contributions

TF conceptualised the aims of the study and supervised the analysis and writing.

FM led the analysis and writing.

All others contributed to the interpretation of the results and the writing of the manuscript

References

American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders: DSM-IVpK748KW3Eq.* Washington, DC: American Psychiatric Association.

Anderson, J.K., Ford, T., Soneson, E., Thompson Coon. J., Humphrey, A., Rogers, M., Moore, D., Jones, P. B., Clarke, E., & Howarth, E. (2018). A systematic review of effectiveness and cost-effectiveness of school-based identification of children and young people at risk of, or currently experiencing mental health difficulties. *Psychological Medicine* 49, 9–19. doi.org/10.1017/S0033291718002490

Cheng, S., K. M. Keyes, A. Bitfoi, M. G. Carta, C. Koç, D. Goelitz, R. Otten, S. Lesinskiene, Z. Mihova, O. Pez and V. Kovess-Masfety (2018). "Understanding parent–teacher agreement of the Strengths and Difficulties Questionnaire (SDQ): Comparison across seven European countries." *International Journal of Methods in Psychiatric Research* 27(1): e1589

Collishaw, S., Goodman, R., Ford, T., Rabe-Hesketh, S. and Pickles, A. (2009), How far are associations between child, family and community factors and child psychopathology informant-specific and informant-general? *Journal of Child Psychology and Psychiatry*, 50, 571-580. doi:10.1111/j.1469-7610.2008.02026.x

De Los Reyes, A., Augenstein, T. M., Wang, M., Thomas, S. A., Drabick, D. A. G., Burgers, D. E., & Rabinowitz, J. (2015). The validity of the multi-informant approach to assessing child and adolescent mental health. *Psychological Bulletin*, 141(4), 858-900. http://dx.doi.org/10.1037/a0038498

Department of Health and Social Care & Department for Education. (2017). *Transforming children and young people's mental health provision: a green paper.* Retrieved from:

https://www.gov.uk/government/consultations/transforming-children-and-young-peoples-mental-health-provision-a-green-paper

Evans, R., Parker, R., Russell, A.E., Mathews, F., Ford, T., Hewitt, G., Scourfield, J. and Janssens, A. (2019), Adolescent self-harm prevention and intervention in secondary schools: a survey of staff in England and Wales. *Child and Adolescent Mental Health*, 24, 230-238. doi:10.1111/camh.12308

Ford, T., Sayal, K., Meltzer, H., & Goodman, R. (2005) Parental concerns about their child's emotions and behaviour and referral to specialist services: general population survey. *British Medical Journal. 331*, 1435-1436

Ford, T., Hamilton, H., Meltzer, H., & Goodman, R. (2007). Child Mental Health is Everybody's Business: The Prevalence of Contact with Public Sector Services by Type of Disorder Among British School Children in a Three-Year Period. *Child and Adolescent Mental Health*, 12(1), 13-20

Frith, E. (2017). Access and waiting times in children and young people's mental health services. *Education policy institute.* Retrieved from: https://epi.org.uk/publications-and-research/access-waiting-times-children-young-peoples-mental-health-services/

Goldberg, D.P., Gater, R., Sartorius, N., Ustun, T.B., Piccinelli, M., Gureje, O. and Rutter, C. (1997), The validity of two versions of the GHQ in the WHO study of mental illness in general health care, *Psychological Medicine*, 27(1), 191-7.

Goodman, R. (1999). The extended version of the Strengths and Difficulties Questionnaire as a guide to child psychiatric caseness and consequent burden. *Journal of Child Psychology and Psychiatry.* 40, 791–799

Goodman, R., Ford, T., Richards, H., Meltzer, H., & Gatward R. (2000). The development and well-being assessment: description and initial validation of an integrated assessment of child and adolescent psychopathology. *Journal of Child Psychological Psychiatry.* 41, 645-57

Goodman, R., Ford, T., Simmons, H., Gatward, R., & Meltzer, H. (2003). Using the Strengths and Difficulties Questionnaire (SDQ) to screen for child psychiatric disorders in a community sample.

International Review of Psychiatry, 15(1-2), 166-172.

Green, H., McGinnity, A., Meltzer, H., Ford, T., & Goodman, R. (2005). *Mental health of children and young people in Great Britain, 2004*. London. Office for National Statistics

Mental Health Taskforce. (2016). *The five year forward view for mental health*. NHS. England. Retrieved from: https://www.england.nhs.uk/mental-health/taskforce/

Mandalia D., Ford T., Hill S., Sadler K., Vizard T., Goodman A., Goodman, R. & McManus, S. (2018). Mental Health of Children and Young People in England, 2017; Services, Informal Support and Education. Health and Social Care Information Centre; London

McNeilis, J., Maughan, B., Goodman, R. & Rowe, R. (2017) Comparing the characteristics and outcomes of Parent- and Teacher-Reported Oppositional Defiant Disorder: Findings from a national sample. *Journal of Child Psychology and Psychiatry*. 59(6), 659-666. doi:10.1111/jcpp.12845

Miller, I.W., Epstein, N.B., Bishop, D.S. and Keitner, G.I. (1985), The McMaster family assessment device: reliability and validity, *Journal of Marital and Family Therapy*, 11(4), 345-56.

Newlove-Delgado, T., Moore, D., Ukoumunne, O, C., Stein, K., & Ford, T. (2015). Mental health related contact with education professionals in the British Child and Adolescent Mental Health Survey 2004. *The Journal of Mental Health Training, Education and Practice*. 10(3) 159-169. http://dx.doi.org/10.1108/JMHTEP-02-2015-0007

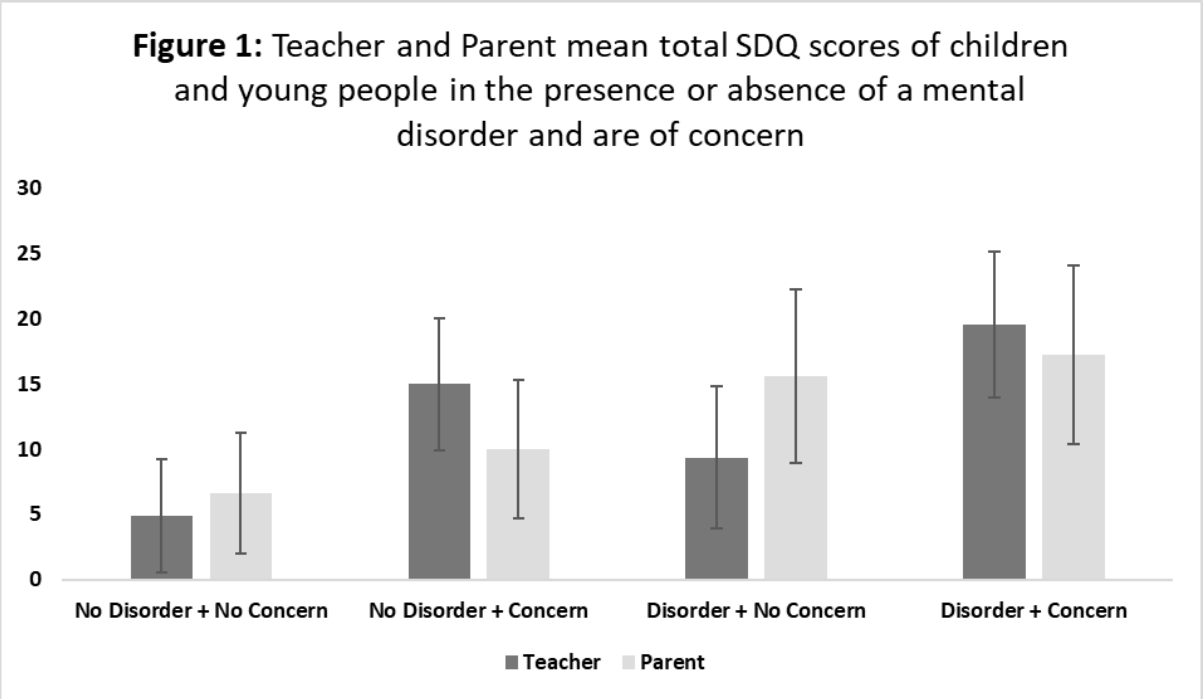
Prince, M. (2003) Measurement in Psychiatry. In Prince, M., Stewart, R., Ford, T., & Hotopf, M. (Eds). *Practical Psychiatric Epidemiology* (pp 13-41). Oxford University Press

Polanczyk, G.V., Salum, G.A., Sugaya, L.S., Caye, A. and Rohde, L.A. (2015), Annual Research Review: A meta-analysis of the worldwide prevalence of mental disorders in children and adolescents. *Journal of Child Psychology and Psychiatry*, 56, 345-365. doi:10.1111/jcpp.12381

Sadler K., Vizard T., Ford T., Goodman A., Goodman R. & McManus, S. (2018). The Mental Health of Children and Young People in England 2017: Trends and characteristics. Health and Social Care Information Centre; London.

Samet, J. M., Wipfli, H., Platz, E. A., Bhavsar, N. 2009 A Dictionary of Epidemiology, Fifth Edition: Edited by Miquel Porta, *American Journal of Epidemiology*, 170 (11), 1449–1451, https://doi.org/10.1093/aje/kwp322

Wolke, D., Waylen, A., Samara, M., Steer, C., Goodman, R., Ford, T., & Lamberts, K. (2009). Selective drop-out in longitudinal studies and non-biased prediction of behaviour disorders. *The British Journal of Psychiatry,* 195(3), 249-256.



Supplementary Table A: Teacher concern missing and non-missing cases by characteristics

Characteristics (n)	Missing n	Missing %	p-value
Gender (*7977)			0.467
Male	1051	25.6	
Female	961	24.9	
Any psychiatric diagnosis (*7977)			0.951
No	1820	25.2	
Yes	192	25.1	
Comorbidity (*7977)			0.074
No	1946	25.0	
Yes	66	30.4	
Emotional disorder (*7977)			0.212
No	1929	25.1	
Yes	83	28.3	
Any ADHD (*7977)			0.915
No	1967	25.2	
Yes	45	25.6	
Any conduct disorder (*7977)			0.951
No	1903	25.2	
Yes	109	25.3	

ASD (*7977)			0.381
No	1992	25.1	
Yes	20	29.9	
Contact: teachers (*7977)			0.666
No	1662	25.3	
Yes	350	24.8	
Contact: special education services (*7977)			0.064
No	1921	25.0	
Yes	91	29.7	
Contact: GP (*7977)			0.115
No	1878	25.0	
Yes	134	28.3	
Contact: CAMHS or Adult services (*7977)			0.248
No	1939	25.1	
Yes	73	28.3	
Ethnicity (*7973)			**0.001**
White	1706	24.7	
Black	69	34.8	
South Asian	149	29.4	
Other	86	24.6	

Table A: ***continued***

Characteristics (n)	**Missing n**	**Missing %**	**p-value**
General Health Questionnaire (*7736)			0.201
Non-case	1463	24.4	
Case	453	25.9	
Family Assessment Device (*7701)			**0.001**
Healthy	1512	23.8	
Unhealthy	393	29.1	
Parental Mental Health (*7865)			**0.004**
Poor	23	38.3	
Fair	121	30.0	
Good	1831	24.7	
Learning disability (*7929)			**0.001**
No	1849	25.6	
Yes	119	16.6	
Epilepsy, CP or muscle coordination (*7865)			0.094
No	1902	25.0	
Yes	73	29.7	
Mother's highest qualification (*7765)			**0.001**
Diploma / Degree	443	21.3	
A-Level / good GCSE	790	24.6	

Mathews, F., Newlove-Delgado, T., Finning, K., Boyle, C., Hayes, R., Johnstone, P., & Ford, T. (2020). Teachers concerns about pupil's mental health in a cross-sectional survey of a population sample of British school-children. *Child and Adolescent Mental Health.* Published online first. http://dx.doi.org/10.1111/camh.12390

Supplementary Table B: Teacher concern missing and non-missing mean values by characteristics

	Characteristic	TC not missing	Mean	TC missing	Mean	p-value
	Age 5-16 years (*7977)	5965	10.29	2012	11.29	0.891
	Number of life events (*7774)	5839	1.00	1935	0.09	**0.001**
	Biological age mother at birth (*7732)	5797	28.39	1935	28.00	0.805
Parent SDQ	**Total difficulties score (*7919)**	5934	7.79	1985	8.51	**0.001**
Parent SDQ	**Impact score (*7926)**	5935	0.51	1991	0.73	**0.001**
Self SDQ	**Total difficulties score (*3434)**	2483	9.89	951	10.32	**0.002**
Self SDQ	**Impact score (*1370)**	986	0.72	384	0.91	**0.027**

TC = Teacher concern
*** total number of missing and non-missing cases**

	Poor GCSE / other / none	697	28.2	
	Family type (*7977)			**0.001**
	Traditional	1205	23.6	
	Single parent	567	29.0	
	Reconstituted	229	26.3	
	Other	11	26.8	
	Family size (*7977)			**0.001**
	One child	380	29.1	
	Two children	881	23.6	
	Three children	503	25.9	
	More than four children	248	24.9	
	Economically active (*7804)			**0.001**
	No	377	31.3	
	Yes	1570	23.8	
	Home ownership (*7972)			**0.001**
	Own home	1343	23.7	
	Rented	666	28.9	

n = number of cases
*** total number of missing and non-missing cases**

Mathews, F., Newlove-Delgado, T., Finning, K., Boyle, C., Hayes, R., Johnstone, P., & Ford, T. (2020). Teachers concerns about pupil's mental health in a cross-sectional survey of a population sample of British school-children. *Child and Adolescent Mental Health.* Published online first. http://dx.doi.org/10.1111/camh.12390

Supplementary Table C: Source of PPV and NPV calculations using current prevalence rates for children and young people with a mental health disorder of 12.8% and Sensitivity and Specificity data from 2003 survey data with teacher concern

		Disease		
		Yes	No	***total***
Test	Positive	657	501	1158
	Negative	510	7449	7959
	total	1167	7950	9117

(Green *et* al, 2005; Mandalia *et al*, 2018)

Table 1:
Definitions of Positive Predictive Value (PPV), Negative Predictive Value (NPV), Sensitivity and Specificity

Epidemiological tests	Definition	Calculation
Positive Predictive value	The probability that a person with a positive test result is a true positive	A/(A+B)x100
Negative predictive value	The probability that a person with a negative test result is a true negative	D/(D+C)x100
Sensitivity	The probability that a diseased person (case) in the population tested will be identified as diseased by the test	A/(A+C)x100
Specificity	Is the probability that a person without the disease (noncase) will be correctly identified as nondiseased by the test	D/(D+B)x100

	Disease	**No Disease**	
Positive (number)	**A** (true positive)	**B** (false positive)	*Test positive*
Negative (number)	**C** (false negative)	**D** (true negative)	*Test negative*
	True Disease	*True No Disease*	**Total**

Samet *et al*, 2009

Mathews, F., Newlove-Delgado, T., Finning, K., Boyle, C., Hayes, R., Johnstone, P., & Ford, T. (2020). Teachers concerns about pupil's mental health in a cross-sectional survey of a population sample of British school-children. *Child and Adolescent Mental Health.* Published online first. http://dx.doi.org/10.1111/camh.12390

Table 2: Predictability of teacher concern in recognising the type of disorder for a child or young person by school age

		Prevalence %	*Positive predictive power*	*Negative predictive power*	*Sensitivity*	*Specificity*
***All ages** *	Any psychiatric diagnosis	9.6	48.6	95.3	56.3	93.7
n = 5965	Comorbidity	2.5	16.9	99.3	74.2	90.5
	Emotional disorder	3.5	13.1	97.7	41.4	90.0
	Conduct disorder	5.4	34.1	98.2	70.4	92.3
	ADHD	2.2	14.8	99.4	74.8	90.3
	ASD	0.8	4.7	99.7	66.0	89.3
***Primary** **	Any psychiatric diagnosis	7.9	43.2	96.4	59.3	93.3
n = 3134	Comorbidity	2.1	14.1	99.4	73.8	90.5
	Emotional disorder	2.3	7.9	98.4	38.0	89.8
	Conduct disorder	4.7	30.0	98.4	69.9	92.0
	ADHD	2.3	16.2	99.4	76.4	90.7
	ASD	0.9	5.6	99.6	65.5	89.7
***Secondary** ***	Any psychiatric diagnosis	11.4	54.3	94.1	54.0	94.1
n = 2831	Comorbidity	3.0	19.9	99.1	74.4	90.6
	Emotional disorder	4.9	18.6	96.9	43.1	90.3
	Conduct disorder	6.2	38.5	98.0	70.9	92.5
	ADHD	2.1	13.4	99.4	72.9	89.9
	ASD	0.6	3.7	99.7	66.7	89.0

*** all children and young people in the survey between 5-16 years**

**** children of primary school age between 5-10 years**

***** young people of secondary school age between 11-16 years**

ADHD: Attention deficit hyperactivity disorder

ASD: Autism spectrum disorder

Mathews, F., Newlove-Delgado, T., Finning, K., Boyle, C., Hayes, R., Johnstone, P., & Ford, T. (2020). Teachers concerns about pupil's mental health in a cross-sectional survey of a population sample of British school-children. *Child and Adolescent Mental Health.* Published online first. http://dx.doi.org/10.1111/camh.12390

Table 3: Testing how well the teacher or parent or both recognise a child or young person with disorder/s by type

		Positive predictive power	*Negative predictive power*	*Sensitivity*	*Specificity*
Both (parent and teacher)	Any Psychiatric Diagnosis	74.4	97.7	63.1	98.6
	Comorbidity	48.7	93.0	92.2	51.5
	Emotional Disorder	32.8	43.9	50.0	27.6
	Conduct Disorder	67.2	72.8	80.9	56.5
	ADHD	37.9	93.5	91.7	44.2
	ASD	14.4	98.2	93.3	40.1
Teacher only	Any Psychiatric Diagnosis	31.4	66.7	48.1	49.7
	Comorbidity	13.6	77.0	35.4	49.1
	Emotional Disorder	17.6	42.5	27.1	42.5
	Conduct Disorder	77.1	54.8	63.9	69.7
	ADHD	18.4	83.7	51.1	52.6
	ASD	2.4	89.6	17.6	49.8
Parent only	Any Psychiatric Diagnosis	33.3	68.6	51.9	50.3
	Comorbidity	23.0	86.4	64.6	50.9
	Emotional Disorder	43.7	82.4	72.8	57.5
	Conduct Disorder	45.2	22.9	36.1	30.3
	ADHD	16.3	81.6	48.9	47.4
	ASD	10.4	97.6	82.4	50.2

ADHD: Attention deficit hyperactivity disorder

ASD: Autism spectrum disorder