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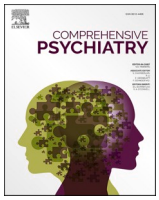

Typological and cumulative approaches to risk and adversity in Child and Adolescent Mental Health Services (CAMHS): Retrospective cohort analysis in South London

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ABSTRACT

Background: Childhood adversity is robustly associated with mental ill-health. Yet questions remain about how different ways of conceptualising adversity relate to psychiatric diagnoses and service activity. This research aims to examine associations between typological and cumulative conceptualisations of adversity, and psychiatric diagnosis and service activity.

Methods: We analysed risk assessment data from 21,072 young people attending mental health services in South London. These assessments include items relating to maltreatment, parental mental health difficulties, substance misuse, self-harm, and violent behaviour. Using latent class analysis, we identified the following risk typologies: 'Maltreatment and externalising behaviours' ($n = 971$, 4·6 %), 'Maltreatment but low risk to self and others' ($n = 2526$, 12·0 %), 'Anti-social behaviour' ($n = 2669$, 12·7 %), 'Inadequate caregiver supervision and risk to self and others' ($n = 907$, 4·3 %), 'Risk to self but not to others' ($n = 1725$, 8·2 %), and 'Mental health needs but low risk to self and others' ($n = 12{,}274$, 58·2 %).

Two cumulative risk models were created: 1) all risk items 2) Adverse Childhood Experiences-related cumulative risk (ACES-CR). Controlling for gender, ethnicity, age, and deprivation, we examined associations between risk typologies, cumulative risk, and the following outcomes: 1) psychiatric diagnosis 2) face-to-face appointments 3) missed appointments 4) referral to social services.

Outcomes: Risk in its various conceptualisations was consistently and robustly associated with conduct disorder. Risk also tended to be associated with more face-to-face appointments, missed appointments, and referral to social services. Associations between individual risk typologies and psychiatric diagnosis and service activity are discussed.

Interpretation: Our findings suggest that typological and cumulative approaches to risk and adversity can produce unique insights about diagnostic practices and service activity. This work provides further evidence for the contribution of contextual factors to mental ill-health and further work is required to explore the longer-term trajectories of these young people.

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1. Overview

To date, much of the research on risk and adversity in young people has conceptualised risk and adversity cumulatively. Recently, there has been movement towards applying typological approaches (e.g., latent class analysis; LCA) to identify subgroups who may be identified as having a particular profile of risk. We searched Web of Science from its inception to May 2024 using the terms (child* OR adolesce* OR "young people") and ("mental health" OR psychopathology OR depress* OR anxiety OR neurodevelopmental) and (LCA OR latent-class analysis OR adversity OR risk) up to May 2024. We identified a scoping review of the LCA literature (k = 58) by Wang and colleagues tracking a proliferation of LCA research on this topic in recent years [1]. This review also included one UK-based study by MacLochlainn and colleagues on ACEs and psychopathology, which concluded that consideration only of ACEs items might a limited account of childhood adversity [2].

2. Literature review

The adverse childhood experiences (ACEs) study by Felitti and colleagues has become a touchstone for conceptualising the association between contextual harm and mental health [3]. Felitti and colleagues surveyed adults about experiences of abuse (i.e. physical, emotional, sexual), neglect (i.e. emotional and physical), and indicators of contextual adversity (i.e. parental mental health difficulties, parental separation, parental substance misuse, parental loss or abandonment, family involvement in the criminal justice system) [3]. Robust associations between childhood adversity and various health outcomes were found.

Since the publication of the ACEs study, numerous studies have converged on the finding that childhood adversity is a risk for later mental health difficulties [4,5]. Subsequently, the ACEs framework generated interest from communities outside of psychiatric epidemiology, including policymakers and practitioners [6].

Recently, however, aspects of the ACEs framework have received critical attention [7,8]. Fundamental to the ACEs conceptualisation is the idea that adversity is cumulative. In the original questionnaire, items were scored on a binary scale indicating the presence of abuse of a given adversity and summed into a total score. Recently, Meehan and colleagues reanalysed the original ACEs data, examining the ability of cumulative scores to predict adverse health outcomes [9]. Meehan and colleagues identified poor classification based on the cumulative scores for mental health, performing modestly better than chance in many cases (e.g., for depression) [9].

One explanation is that not all adversities are equally weighted and additive. Some support for this explanation can be found in educational psychology where there is evidence to suggest the effects of adversity on cognitive development do not appear to be additive [10]. Indeed, Lian and colleagues have speculated that ACEs risk classification may be strengthened by combining cumulative and typological approaches [11].

Recently, literature has accumulated using latent class analysis (LCA) to identify subgroups of people who may have experienced distinct types of adversity (see Wang and colleagues for review) [1]. In contrast to variable centred approaches, LCA identifies subgroups of young people with similar characteristics. Only a few UK-based studies have used this method to examine risk and adversity in young people. One such study reflected that the ACEs conceptualisation of adversity provides a too limited account of childhood adversity [2].

Indeed, clinical services are often concerned with a broader range of safety threats including self-harm and dangerous behaviour. Recently, we conducted a series of LCAs on risk assessments in South London, identifying subgroups of children deemed at risk for various types of safety threats (see Method) [12]. These profiles could provide useful and complementary insights to cumulative approaches for hypothesis-generation regarding associations between adversity, diagnostic practices and service activity.

Within a context where mental health needs and service demands are increasing and the contribution of risk and adversity is unclear, such hypothesis-generating work is pressing [13,14]. Some evidence for the role of adversity can be found in recent epidemiological work by McKenna and colleagues who found that in Northern Ireland children with social work involvement were considerably more likely than children without social work involvement to be in contact with services for issues related to mental health [15]. Similar findings have been observed in England [16]. However, despite the importance of understanding the factors that influence service demand, no studies to our knowledge have examined how risk and adversity impacts two key aspects of service activity: i) the number of face-to-face appointments and ii) the number of missed face-to-face appointments (DNAs).

The current study aims to address these gaps and build on our previous research which applied LCA to a sample of risk assessments conducted in mental health services in South London [12]. We have selected risk assessments as they are aimed at capturing adversity which has been either established, assumed, or predicted by clinicians. This is supported by Daniel's (p. 233) point that risk is "adversity translating into negative outcomes for the child" [17].

We examine two cumulative approaches to adversity. The first was a cumulative score based on the 22-items from clinical risk assessment. This risk assessment includes various safety threats including maltreatment, extrafamilial violence, antisocial behaviour, substance use (child), risk taking behaviours (child) and issues around school exclusion and attendance. The second approach selects a subset of seven-items that are conceptually consistent with the ACEs questionnaire. Further details about the risk assessment are presented in the methods.

We also examine the correlates of six profiles of risk, which we identified in a previous study building on previous work [12]. These are 1: Maltreatment and externalising behaviours; 2: Maltreatment but low risk to self and others; 3: Anti-social behaviour; 4: Inadequate caregiver supervision and risk to self and others; 5: Risk to self but not to others; 6: Mental health needs but low risk to self and others.

We regard these as related,but distinct conceptualisations of adversity and refer to them as such throughout the manuscript.

This work is guided by two questions:

1. What is the association between risk typologies and 1) International Statistical Classification of Diseases and Related Health Problems (ICD-10) diagnosis 2) face-to-face appointments 3) DNAs 4) referral to social services?
2. What is the association between i) cumulative risk and ii) ACEs-related risk, and 1) ICD-10 diagnosis 2) face-to-face appointments 3) DNAs 4) referral to social services

3. Methods

3.1. Cohort

This study builds on previous work examining risk rates and profiles in Child and Adolescent Mental Health Services (CAMHS) [12]. Previously, we extracted data for young people (n = 21,688) seen by mental health services in South London between 2007 and 2017. During this period, safety threats to young people in contact with mental health services in South London were routinely screened using a 'brief risk assessment' (further details below). Each young person's first assessment was extracted. Risk fields are required fields and thus there was no missing data. The only variables with missing data were ethnicity (6·7 %) and deprivation (1·1 %). Missing data for these variables were imputed using the random forest command in MICE with 10 rounds of imputation [18]. There were too few cases of non-binary genders to be included in the analysis. Ethnicity was coded according to ONS categories [19]. The index of multiple deprivation was used as a measure of economic wellbeing [20]. Demographic information about the sample is

provided in the supplement (S1).

3.2. Ethical approval

The National Research Ethics Committee South Central Oxford C (ref: 23/SC/0257) approved Clinical Interactive Search (CRIS) for secondary data analysis. Project approval for the current analysis was provided by the CRIS oversight committee (21–029).

3.3. Risk and adversity

The brief risk assessment is a clinician-rated assessment. The assessment asks clinicians to reflect on risk in response to the following prompts: 1. parent mental health*, 2. parent substance misuse*, 3. emotional abuse (victim), 4. physical abuse (victim), 5. sexual abuse (victim), 6. neglect or lack of supervision, 7. domestic violence*, 8. gang crime (victim), 9. culture of violence, 10. violence towards others, 11. destructive behaviour, 12. offending, 13. dangerous behaviour, 14. physical abuse (perpetrator), 15. exclusion from school, 16. sexual abuse (perpetrator), 17. neglect to self, 18. substance misuse, 19. not attending school, 20. running away, 21. self-harm, 22. risk-taking behaviour. Clinicians are typically asked to fill this out within the first six months of engaging with a child or young person.

Seven of the items (denoted by an *) in this assessment are conceptually consistent with the ACEs questionnaire. The missing items are parental separation/divorce, familial involvement in the criminal justice system, and emotional neglect.

Some of the items (e.g., parental mental health difficulties) were originally coded on a binary scale (i.e. yes/no) and others (e.g., risk of self-harm) were coded on an ordinal scale (not known, no, low, medium, high) [12]. For consistency and to facilitate the LCA these items were dichotomised into two categories: i) low risk/not known and ii) medium/high risk.

Then we created two cumulative risk scores. The first was a cumulative score based on the 22-items from the brief risk assessment (22-item CR). The second was a seven-item ACEs-related cumulative risk score (ACES-related CR).

The risk assessment also includes information about physical and learning disability, experiences of war/torture, and the clinician's responses to the safety threats identified (e.g., referral to social services). These items were discussed in the research team, which includes practitioners and experts-by-experience, and it was decided that these additional factors were at a different level of analysis (e.g., a service's response to risk rather than risk itself) than the other items, and thus were not included in LCA or cumulative risk scores. Further work is planned to examine these items.

As reported elsewhere, we applied latent class analysis to this sample, identifying six risk profiles [12]. Details of class fit can be found in the previous study. These profiles will be briefly summarised below. Group sizes are based on the current sample ($N = 21{,}072$).

1. Maltreatment and externalising behaviours ($n = 971$, 4·6 %).
2. Children and young people (CYP) in this class were at an increased risk of experiencing various forms of maltreatment such as emotional, sexual, and physical abuse, as well as neglect and domestic violence. Clinicians frequently observed externalising problems, such as violence towards others, in these CYP.
3. Maltreatment but low risk to self and others ($n = 2526$, 12·0 %).
4. Similar to the first class, clinicians commonly identified these CYP as likely to experience maltreatment. CYP in the second class were not particularly at risk of harming themselves, others or experiencing difficulties in school.
5. Anti-social behaviour ($n = 2669$, 12·7 %).
6. Maltreatment, parental mental health difficulties, and parental substance misuse were not commonly identified by clinicians for CYP in this class. These CYP were characterised as having anti-social and externalising behaviours, including being at an increased risk of being violent towards others, committing destructive and dangerous behaviours, risk-taking and perpetrating physical abuse.
7. Inadequate caregiver supervision and risk to self and others ($n = 907$, 4·3 %).
8. Out of all the classes, CYP in this class were perceived as having the highest risk of neglect and lack of supervision. Out of all classes, they were most likely to experience externalising and anti-social behaviours and were perceived to be a risk to themselves (e.g., through self-harm) and to others (e.g., through offending).
9. Risk to self but not to others ($n = 1725$, 8·2 %).
10. CYP in this class were unlikely to experience maltreatment. Clinicians had relatively few concerns about externalising and anti-social behaviours in this class. However, risk for self-harm was highest in this class and risk-taking behaviours, self-neglect and substance misuse were also commonly identified.
11. Mental health needs but low risk to self and others ($n = 12{,}274$, 58·2 %).
12. Despite experiencing significant mental health needs which required referral to CAMHS, clinicians perceived CYP in this class as being low risk for all items on the risk assessment, except parental mental health difficulties.

3.4. Service activity and diagnosis

Service activity data and diagnosis were extracted. Counts for the number of face-to-face appointments attended and the number of face-to-face appointments not attended (DNA) were extracted. Past child protection involvement and subsequent referral to social services were part of the risk assessment. For diagnosis, we extracted the ICD-10 diagnosis closest in time to the risk assessment being conducted.

Psychiatric diagnoses were grouped into higher-level categories following several rounds of consultations with the research group. In the first round, two researchers coded individual ICD-10 diagnoses. The agreement was 75·37 %. Two clinical academics working in children's mental health services in England and a developmental scientist provided feedback on the framework. This process yielded eight categories: Anxiety or stress related disorders; Conduct disorder and mood; Conduct disorders; Developmental disorders; Mood disorders; Other mental health disorders; Other non-mental health disorders; Severe mental health disorders including eating disorders (see [S3] for more details).

3.5. Analysis

The initial cohort included data from 21,688 young people. Outlier analysis was conducted on two variables: i) number of face-to-face appointments attended and ii) number of DNAs. Observations were flagged as outliers if the counts were three standard deviations above the mean. Class assignments among outliers were examined to see if outliers were confined to risk groups, as opposed to the low-risk group.

Outlier analysis identified 384 (1·7 %) and 422 (1·95 %) extreme values for face-to-face appointments and DNAs respectively. The mean face-to-face appointments and DNAs among outliers were M = 158·09 (SD = 84·66) and M = 37·29 (SD = 16·23), respectively. It did not appear that these extreme values were linked to specific risk typologies. Following discussions among the research team, which includes clinicians working in the service, these outliers were excluded because it was reasoned cases may not be representative of the wider population of CYPs in contact with mental health services. The mean face-to-face appointments and DNAs for the remaining sample ($n = 21{,}072$) was M = 9·7 (SD = 12·96) and M = 2·70 (SD = 3·80), respectively.

As reported in the previous study, LCA was conducted in R using the package 'glca' [21]. Procedures for model selection are reported

elsewhere [12] but include examination of the Akaike Information Criterion (AIC), Bozdogan's criterion (CAIC), Bayesian Information Criterion (BIC) and relative entropy [12]. At present, it is not possible to incorporate distal outcomes in LCA models in R and to our knowledge no R package facilitates LCA with more than two covariates. Thus, classes were extracted and included as a new variable for regression modelling.

Overdispersion was found in Poisson regressions (face-to-face dispersion = 17.07; DNA dispersion = 5.19), thus count data were modelled using negative binomial modelling (face-to-face dispersion = 0.87; DNA dispersion = 0.62). Gender, age, ethnicity, level of deprivation and previous social care involvement were included as covariates. We report rate ratios (RR) and confidence intervals (CIs). Detailed model summaries can be found in the supplement (S4-S39).

3.6. Role of the funder

The funders did not have a role in study design, data collection, analysis, or interpretation, including writing the manuscript.

4. Results

4.1. Overview

The final sample for this study consisted of 21,072 young people, of whom 12,034 (57 %) were male and 9038 (43 %) were female. The majority of the cohort was white (11,205; 53 %), 1884 (9 %) were of mixed ethnicity, 1046 (5 %) were Asian, 6048 (29 %) were black and 889 were identified as 'other' (4 %). The numbers of young people in each IMD quintile (most to least deprived) were: i) 7823 (37 %); ii) 6923 (33 %); iii) 3646 (17 %); iv)1650 (8 %); v) 1030 (5 %). The mean age of the sample was 11·11 years (SD = 4·21) and the median was 12.

The frequency of diagnoses across the cohort was as follows: anxiety was diagnosed in 4295 (20 %) cases, conduct and mood problems in 979 (5 %) cases, conduct disorders in 750 (4 %) cases, developmental in 4070 (19 %) cases, mood in 1365 (6 %), no diagnosis in 6606 (31 %) cases, other mental health in 1451 (7 %) cases, other non-mental health 802 (4 %) and severe mental health including eating problems in 745 (4 %) cases.

The mean CR (0−22) was 2.64 (SD = 3·19) and the median was 0. For ACEs-related CR the mean score was 1 (SD = 1·41) and the median was 0.

Regarding face-to-face appointments, the mean number of appointments was 9·7 (SD = 12.96) and the median was 5. The mean number of DNAs was 2.70 (SD = 3·80) and the median was 1. Regarding contact with social services, 4594 (22 %) had previous social work involvement and 1220 (6 %) assessments indicated that a referral to social services was required.

Further details about the cohort tabulated by risk typologies are presented in Tables 1 and 2.

4.2. Risk typologies, and diagnosis and service activity

As described in Table 3, except for the class 'Maltreatment but low risk to self and others', all other risk typologies had higher rates of conduct disorders compared to the reference class 'Mental health needs but low risk to self and others'. Many of these rate ratios were considerable (e.g., 'Inadequate caregiver supervision and risk to self and others'). One class, 'Maltreatment but low risk to self and others', had higher rates of anxiety, compared to the reference group. All classes had higher rates of conduct and mood disorders compared to the reference class. There was considerable variability between classes regarding the rates of the remaining diagnosis (see Table 3). Regarding service activity, except for the 'Inadequate caregiver supervision and risk to self and others' group where no significant association was found, risk typologies tended to have higher rates of face-to-face appointments compared to the reference class. Rate ratios for DNAs were consistently and sometimes substantially higher in these classes. Rate ratios for referral to social services were also substantially higher (e.g., 'Maltreatment and externalising behaviours').

4.3. 22-item CR, and diagnosis and service activity

Young people who had higher CR scores had higher rates of conduct disorders, conduct and mood disorders, and other mental health disorders. Conversely, higher cumulative risk was negatively associated with rates of anxiety and related disorders. We did not find evidence of associations between cumulative risk and developmental, mood, other non-mental health disorders, or severe mental health disorders. Regarding service activity, there was a positive association between cumulative risk and face-to-face appointments, DNAs and referral to social services. See Table 4 for RR and CIs and the supplement (S4-S39) for model information.

4.4. ACEs-related CR, and diagnosis and service activity

Similarly, young people who had higher cumulative scores on ACEs-related CR had higher rates of conduct disorders and conduct and mood disorders. However, unlike the 22-item CR, higher ACEs-related CR was also positively associated with mood, no, and other non-MH. In contrast to the 22-item CR score, no association between ACEs-related CR and

Table 1
Risk classes and age, number of face-to-face appointments attended, number of did-not-attend appointments, and cumulative risk score.

		Risk classes					
		Mental health needs but low risk	Maltreatment and externalising behaviours	Antisocial behaviour	Inadequate caregiver supervision and risk to self and others	Maltreatment but low risk to self and others	Risk to self but not others
Age	Mean	10·66	12·06	10·57	14·06	10·56	13·89
	Median	11·00	13·00	11·00	15·00	11·00	15·00
	SD	4·28	3·78	3·80	2·65	4·29	3·10
Face-to-face appointment	Mean	9·09	11·78	10·72	8·82	10·04	11·44
	Median	5·00	6·00	6·00	4·00	5·00	6·00
	SD	12·42	14·44	13·30	12·42	13·07	14·93
Did-not-attend appointment	Mean	2·34	3·74	3·21	3·01	3·18	3·06
	Median	1·00	2·00	2·00	1·00	2·00	1·00
	SD	3·43	4·52	4·17	4·26	4·19	4·04
Cumulative risk score	Mean	0·65	8·93	4·42	11·68	3·74	4·06
	Median	0·00	9·00	4·00	11·00	3·00	4·00
	SD	0·79	2·23	1·73	3·06	1·44	1·60

Table 2
Risk classes and diagnosis, past child protection plan, and referral to social services.

		Risk classes					
		Mental health needs but low risk	Maltreatment and externalising behaviours	Antisocial behaviour	Inadequate caregiver supervision and risk to self and others	Maltreatment but low risk to self and others	Risk to self but not others
		N	*N*	*N*	*N*	*N*	*N*
Diagnosis	Anxiety	2753	182	295	91	641	333
	Conduct/mood	336	111	225	116	121	70
	Conduct	218	46	261	137	45	43
	Developmental	2415	130	909	190	190	236
	Mood	671	72	69	44	177	332
	No diagnosis	4070	302	605	179	1060	390
	Other mental health	809	76	195	85	136	150
	Other non-mental health	497	35	68	36	110	56
	Severe mental health	505	17	42	29	46	115
Past child protection plan	No	10,403	541	2063	567	1542	1362
	Yes	1871	430	606	340	984	363
Social services referral	No	12,089	730	2501	704	2266	1562
	Yes	185	241	168	203	260	163

other mental health was found. There were also negative associations between ACEs-related CR and developmental disorders and severe mental health disorders. Like the 22-item cumulative score, associations between ACEs-related CR service activity tended to be positive but more substantial, with the following rates: face-to-face appointments, DNAs and referral to social services. See Table 5 for RR and CIs and the supplement (S4-S39) for model information.

5. Discussion

This study provides evidence that risk has some robust associations, both positive and negative, with different psychiatric diagnoses. Moreover, by drawing on typological and cumulative approaches, this study illustrates how different conceptualisations of risk can be used to produce complementary yet distinct insights about the associations between risk and mental health and service activity. This is evident in the cases of conduct disorders, one of the most common reasons for referral to mental health services for young people in England [16].

For some classes (e.g., 'Anti-social behaviour') high rates of conduct disorders were expected because the risk assessment includes items that are regarded as characteristics of conduct disorder (e.g., destructive behaviour). Still, even the class who were deemed as a risk to themselves were more likely to have a diagnosis of conduct disorder. Moreover, ACEs-CR scores also showed that for each unit increase, there was a 17 % increase in rates of conduct disorder. Therefore, on balance and in line with previous meta-analytic work and cohort work in South London, these findings tend to suggest that adversity can play a key role in the profile of young people diagnosed with conduct disorders [22,23]. Given the associations between conduct disorder and adult mental health difficulties [24], it may be useful for future research to examine the diagnostic trajectories of young people in these classes.

Another key finding was the variation between different risk conceptualisations and their associations with developmental disorders. For instance, we did not find evidence of an association between the 22-item CR scores. And yet there were robust negative associations between ACEs-CR and developmental disorders. These results suggest the rates of developmental disorders in this clinical cohort are lower among young people who are identified as having experienced ACEs-related risk. Here consideration of the typological approaches is illustrative as we see that some (e.g., 'Maltreatment and externalising behaviours') but not all (e.g., 'Inadequate caregiver supervision and risk to self and others') maltreatment-related risk typologies had lower rates of developmental disorders.

Reflecting on these findings, experts-by-experience co-authors commented that conduct disorder can be a stigmatising and individualising diagnosis for young people who have experienced adversity. Also, although this diagnosis may be useful clinically (e.g., for guiding intervention), experts-by-experience contrasted conduct disorders with developmental disorders which were deemed to have more explanatory power. It would be useful for future studies to examine these diagnostic practices in greater detail, including examination of longer-term trajectories.

Given the demand for mental health support is increasing and services are stretched, identifying the contextual and social determinants of mental health service use is crucial [13,14]. The findings from this study show that risk in its various conceptualisations is associated with higher rates of face-to-face appointments. There is some considerable variation however. For instance, 22-item CR scores are significantly but only weakly associated with face-to-face appointments (RR = 1.03). Associations in some of the latent class group "maltreatment and externalizing behaviours" are materially higher (RR =1.34). This highlights the benefits of adopting a varied approach to conceptualising risk (e.g., latent classes, cumulative) examine the correlates of face-to-face appointments.

Although it might seem positive that risk is generally associated with more face-to-face appointments, it is possible that certain types of non-therapeutic appointments (e.g., inpatient stays) are contributing to this increase. This aligns with research in Northern Ireland and England which shows that children who are subject to social care interventions are more likely to be in contact with mental health services [15,16].

Concerningly, adversity was also associated with DNAs. Consultations with policymakers and experts-by-experience have suggested a material barrier to mental health services for young people and families is that appointments are often offered during working or school hours. Expert-by-experience co-authors also highlighted that it may be the case that services are not suited to these young people's needs. To our knowledge, no research has addressed this question empirically.

Expectedly, risk in all its conceptualisations was associated with higher rates of referral to social services. From a methodological perspective, these findings provide validation for the typological and cumulative approaches. From a clinical perspective questions arise regarding what happened next for these young people. As we have

Table 3
Risk ratios for each risk class and face-to-face appointments, did-not-attend appointments, referral to social services, and diagnosis.

		Risk classes											
		Maltreatment and externalising behaviours			Antisocial behaviour			Inadequate caregiver supervision and risk to self and others			Maltreatment but low risk to self and others			Risk to self but not others		
		Rate Ratio	Lower CI	Upper CI	Rate Ratio	Lower CI	Upper CI	Rate Ratio	Lower CI	Upper CI	Rate Ratio	Lower CI	Upper CI	Rate Ratio	Lower CI	Upper CI
F2f		1·34	1·25	1·44	1·21	1·16	1·27	1·00	0·93	1·08	1·13	1·08	1·19	1·26	1·19	1·33
DNA		1·53	1·39	1·67	1·34	1·26	1·42	1·22	1·11	1·35	1·31	1·24	1·40	1·29	1·20	1·38
Referral to SS		20·08	16·26	24·84	4·51	3·63	5·60	18·33	14·63	22·99	6·95	5·71	8·47	6·31	5·05	7·90
Diagnosis	Conduct	2·80	1·99	3·86	5·32	4·41	6·43	10·59	8·27	13·53	0·99	0·70	1·36	1·76	1·24	2·45
	Anxiety	0·75	0·63	0·89	0·48	0·42	0·54	0·34	0·27	0·42	1·19	1·08	1·32	0·63	0·55	0·72
	Conduct/mood	4·27	3·37	5·37	2·95	2·47	3·52	5·04	3·96	6·37	1·65	1·33	2·05	1·63	1·23	2·12
	Developmental	0·72	0·59	0·87	1·81	1·64	1·99	1·18	0·99	1·41	0·37	0·32	0·44	0·92	0·79	1·07
	Mood	1·05	0·80	1·36	0·60	0·46	0·78	0·51	0·37	0·70	1·34	1·12	1·61	2·05	1·76	2·39
	No diagnosis	0·91	0·79	1·06	0·57	0·52	0·63	0·61	0·51	0·73	1·32	1·21	1·45	0·73	0·64	0·82
	Other MH	1·21	0·94	1·54	1·09	0·93	1·29	1·54	1·20	1·95	0·78	0·64	0·94	1·45	1·19	1·74
	Other non-MH	0·90	0·62	1·27	0·63	0·48	0·81	1·04	0·72	1·47	1·07	0·86	1·33	0·81	0·60	1·07
	Severe MH	0·40	0·23	0·64	0·62	0·44	0·84	0·70	0·46	1·03	0·49	0·36	0·67	0·93	0·74	1·16

F2f = face-to-face appointment, DNA = did-not attend appointment, SS = social services, MH = mental health, CI = 95 % confidence interval.
Reference risk class: Mental health needs but low risk

Table 4
Risk ratios for the 22-item cumulative risk score and face-to-face appointments, did-not-attend appointments, referral to social services, and diagnosis.

		Cumulative risk		
		Rate Ratio	Lower CI	Upper CI
Face to face appointment		1·03	1·02	1·03
Did-not-attend appointment		1·05	1·04	1·05
Referral to social services		1·30	1·28	1·31
Diagnosis	Conduct	1·19	1·17	1·21
	Anxiety	0·93	0·92	0·95
	Conduct/mood	1·16	1·14	1·17
	Developmental	0·99	0·98	1·01
	Mood	1·01	0·99	1·03
	No diagnosis	0·95	0·94	0·96
	Other mental health	1·03	1·01	1·05
	Other non-mental health	0·99	0·96	1·01
	Severe mental health	0·98	0·95	1·00

CI = 95 % confidence interval.

Table 5
Risk ratios for the adverse childhood experiences (ACES) risk score and face-to-face appointments, did-not-attend appointments, referral to social services, and diagnosis.

		ACES risk score		
		Rate Ratio	Lower CI	Upper CI
Face-to-face appointment		1·05	1·04	1·06
Did-not-attend appointment		1·10	1·08	1·11
Referral to social services		1·72	1·66	1·78
Diagnosis	Conduct	1·12	1·06	1·17
	Anxiety	1·01	0·98	1·03
	Conduct/mood	1·26	1·21	1·31
	Developmental	0·77	0·75	0·80
	Mood	1·08	1·04	1·12
	No diagnosis	1·04	1·02	1·06
	Other mental health	1·03	0·99	1·07
	Other non-mental health	1·06	1·01	1·11
	Severe mental health	0·76	0·70	0·81

ACES = Adverse childhood experiences, CI = 95 % confidence interval.

discussed, risk is robustly associated with various psychiatric diagnoses. Yet qualitative work with psychologists indicates that in some situations mental health services can be reluctant to accept young people experiencing contextual risk [25]. Further research examining the mental health trajectories of children referred from mental health to social services would be illuminating.

From a clinically perspective, clinicians assess risk every day yet very few empirical studies have examined what risk predicts. Here we provide a number of frameworks for conceptualising risk, some of which may be helpful for stimulating thinking about risk specifically, the social context of mental health broadly, and how mental health professionals respond to these risks. The findings from this study highlight the potential role of perceptions of risk in shaping diagnostic practices and various aspects of service activity (e.g., face-to-face appointments, DNAs, referral to social services).

For example, anxiety is one of the most common reasons for referral to mental health services in England [16] yet in many cases risk is negatively associated with anxiety. By contrast, conduct problems seem consistently associated with risk. For clinicians, these findings might stimulate thinking about the potential for an overshadowing effect of

risk or adversity on diagnosis. As highlighted above, further hypothesis driven work, including analysis of diagnostic trajectories would be useful to determine the continuity of these diagnoses over time and into adulthood.

Regarding service activity, these insights might be useful for understanding the context of young people missing appointments, including which young people are likely to miss appointments. This might lead to tailored measures and follow-up research to better help young people engage with mental health services. For example, young people in class one maltreatment and externalising behaviour are at heighten risk of missing appointments (RR = 1.53). Therefore, for clinicians working with young people who have these difficulties may consider how additional measures (e.g., transport vouchers; flexible appointment times) might be mobilised to better help these young people access mental health services.

The generalisability of these findings reported here are subject to certain limitations, many of which have been discussed in our previous paper [12]. One of the main uncontrolled factors in this study is the lack of context regarding the risk assessments (e.g., duration of assessments, availability of informants, sources of information).

A technical limitation was that no current R program allows the incorporation of distal outcomes in LCA or allows for controlling more than two covariates. This means that to examine associations between risk typologies and diagnosis and service activity we treated LCA class assignment as a manifest variable. Thus, our models do not account for the uncertainty in class assignment.

Our previous work [12] showed differences across various sociodemographic characteristics including gender, age, ethnicity, and level of deprivation. Therefore, although we included these factors in our analysis, some caution is required because it was not possible to condition latent classes in the current analysis on each of these aspects of sociodemographic differences.

Another important consideration is the grouping of diagnoses. We acknowledge and appreciate that other teams or stakeholders might have grouped the wide range of diagnoses differently.

Finally, data from various sources indicates that economic disadvantage is a safety threat to young people's wellbeing [26]. It would be useful for future studies to include more granular indicators of economic disadvantage (e.g., housing status, food insecurity).

Nevertheless, the results from this study suggest that risk is robustly associated with psychiatric diagnosis and mental health service use, confirming contextual adversity as a potent social determinant of mental health. Our analysis shows typological and cumulative approaches generate unique insights about these associations.

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CRediT authorship contribution statement

Barry Coughlan: Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Nicole Marshall:** Writing – review & editing, Writing – original draft, Project administration, Investigation, Data curation, Conceptualization. **Matt Woolgar:** Writing – review & editing, Validation, Investigation, Conceptualization. **Julia Mannes:** Writing – review & editing, Writing – original draft, Project administration, Investigation, Data curation, Conceptualization. **Paige Erkiert:** Methodology, Data curation. **Ayla Humphrey:** Writing – review & editing, Writing – original draft, Conceptualization. **Jack Smith:** Writing – review & editing, Writing – original draft, Conceptualization. **Taliah Drayak:** Writing – review & editing, Writing – original draft, Conceptualization. **Francesca Crozier-Roche:** Writing – review & editing, Writing – original draft, Conceptualization. **Tessa Morgan:** Writing – review & editing, Writing – original draft, Supervision, Conceptualization. **Dustin Hutchinson:** Writing – review & editing, Writing – original draft, Conceptualization. **David Graham:** Writing – review & editing, Writing – original draft, Conceptualization. **Rick Hood:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Robbie Duschinsky:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization.

Declaration of competing interest

No conflicts to declare.

Data availability

Data are owned by a third party, Maudsley Biomedical Research Centre (BRC) Clinical Records. Interactive Search (CRIS) tool, which provides access to anonymised data derived from SLaM electronic medical records. These data can only be accessed by permitted individuals from within a secure firewall (i.e. the data cannot be sent elsewhere), in the same manner as the authors. For more information please contact: cris.administrator@slam.nhs.uk.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.comppsych.2024.152568.

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