**ORIGINAL ARTICLE**

# Prevalence, Inequalities, and Impact of Bullying in Adolescence: Insights from the #BeeWell Study

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**Abstract**

Measurement is fundamental to understanding and preventing bullying, but approaches in the field are inconsistent, producing much conflicting evidence. We illustrate this by demonstrating the sensitivity of findings to researcher-led analytical decisions (exposure threshold and type(s) of bullying considered) in a study addressing the following aims: (i) to determine the prevalence of bullying; (ii) to establish the nature and extent of inequalities in bullying exposure between different socio-demographic groups; (iii) to examine the relationship between bullying exposure and internalising symptoms; and (iv) to establish if this relationship varies between socio-demographic groups. Adolescents aged 12–15 ($N = 35,825$) attending 147 secondary schools in the #BeeWell study completed measures of bullying and internalising mental health difficulties. These data were linked to information on their socio-demographic characteristics (e.g. socio-economic disadvantage). A series of pre-registered analyses were undertaken. With regard to the first aim, the prevalence of bullying victimisation was found to range between 5 and 16%. In relation to the second aim, disparities in exposure to bullying were consistently found among gender and sexual minorities (vs cisgender heterosexual boys), those with special educational needs (vs those without special educational needs), younger students (vs older students), and those from more disadvantaged neighbourhoods (vs those from less disadvantaged neighbourhoods), irrespective of the bullying exposure threshold or type being considered. However, disparities among cisgender heterosexual girls (vs cisgender heterosexual boys) and ethnic minority groups (vs White students) varied by exposure threshold and type of bullying. Pertaining to the third aim, the population attributable fraction for the association between bullying exposure and internalising symptoms was found to range between 6 and 19%, with the odds ratio ranging between 3.55 and 4.20. Finally, in terms of the fourth aim, there was limited evidence that the magnitude of the impact of bullying victimisation varied across socio-demographic subgroups, except that bullying exposure was more strongly associated with internalising symptoms among LGBTQ+ young people and cisgender heterosexual girls (vs cisgender heterosexual boys), and less strongly associated with internalising symptoms among Black students (vs White students). Our findings speak to the importance of developing more consistent measurement practices in bullying research, with consequent implications for prevention and intervention. These implications are contextualised by consideration of study strengths and limitations.

**Keywords** Measurement · Bullying · Prevalence · Inequalities · Adolescence · Mental health

## Introduction

Bullying is social aggression enacted upon an individual (or group), with the intention to cause harm, that is repeated over time and involves an imbalance of power that favours the perpetrator(s) (Olweus & Limber, 2018). A distinction is typically made between 'traditional' (e.g. that carried out face to face, such as hitting, calling names, or leaving the victim out of games) and 'cyber' (e.g. that carried out via digital media, such as posting negative online content about the victim) bullying (Arseneault, 2018). It is believed to be a common occurrence in childhood and adolescence (Hosozawa et al., 2021; UNESCO, 2019). Exposure to bullying is associated with mental health difficulties and a range of other negative outcomes (e.g. poorer general health, lower academic attainment) across the lifespan (Arseneault, 2018; Wolke & Lereya, 2015). Accordingly, it is a major public health concern (Bryson et al., 2021).

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Measurement is fundamental to understanding and preventing bullying because of the role it plays in establishing prevalence estimates, determining inequalities, assessing consequences, and evaluating the efficacy of intervention efforts (Jia & Mikami, 2018). However, measurement strategies in the field are inconsistent, and this lack of consistency is the source of much apparently conflicting evidence (Vivolo-Kantor et al., 2014). Measures of bullying vary in a number of ways, including, for example, informant (e.g. self-report, teacher-report, peer-report, parent-report), structure (e.g. use of single versus multiple items), content (e.g. type(s) of bullying considered), inclusion of contextual information (e.g. explicit definition of bullying and/or use of examples), and the degree to which definitional criteria are included (e.g. whether reference to intentionality, power imbalance, and/or repetition are embedded in a given measure) (Green et al., 2017; Jia & Mikami, 2018; Modecki et al., 2014). This variability is likely underpinned by definitional challenges and debates, perceptions of the value and accuracy of the perspectives of different informants, and advancements over time in measurement science (Green et al., 2017).

In the current study, we leverage secondary analysis of a unique contemporary dataset (#BeeWell) to illustrate this by demonstrating the sensitivity of findings to researcher-led analytical decisions (exposure threshold and type(s) of bullying considered), with a particular focus on prevalence (how many are bullied?), inequalities (who is more likely to be a victim of bullying?), and impact (how is exposure to bullying associated with mental health outcomes?).

## Bullying Prevalence and Measurement Issues

Prevalence estimates of bullying victimisation vary significantly between studies (e.g. from 5 to 65%; Jadambaa et al., 2019). At least some of this is attributable to variability in measurement (Vivolo-Kantor et al., 2014). In a major meta-analysis, Modecki et al. (2014) reviewed 80 studies that reported prevalence rates with adolescent samples using self-report measures. The authors found that studies using measures that included a definition (i.e. referencing the three key bullying criteria of power imbalance, intentionality, and repetition) reported significantly higher prevalence rates than those that did not. By contrast, studies using measures that provided an example (of targeted behaviours, such as posting hurtful messages online), referenced 'bully(ing)' and/or 'making fun/teasing' reported significantly lower prevalence rates than those that did not.

Modecki et al. (2014) also reported that traditional (e.g. relational) bullying was twice as common as cyberbullying, though the two were highly correlated. Other meta-analytic evidence has pointed to similar conclusions (Jadambaa

et al., 2019). Possible explanations for this lower prevalence centre around the different ways that the constituent elements of power imbalance, repetition, and intentionality play out in the cyberbullying context (Johansson & Englund, 2021). For example, perpetrators of cyberbullying are often anonymous (in contrast to traditional forms of bullying which typically occur 'face to face'), meaning the perpetrator does not typically see their victim's reaction and/or gain perceived status by showing abusive power over others in front of witnesses. This difference in the power imbalance aspect may therefore make cyberbullying less attractive than traditional bullying (Johansson & Englund, 2021; Salmivalli et al., 2013). However, as above, measurement issues likely also play a role. For example, using the term 'cyberbullying' may result in lower prevalence estimates compared to referencing specific examples (such as 'someone sending a mean text or online messages about you') (Kowalski & Whittaker, 2015). Furthermore, Smith (2019) has noted that higher prevalence figures are obtained when the definition of cyberbullying is left broad or undefined, and/or when a long timeframe reference period (or even 'ever' or 'just once or twice') is used.

The above noted issue of timeframe (and relatedly, response options of detailed frequency) was also highlighted in a recent systematic review (Xie et al., 2022). The authors found that nearly half of the reviewed measures did not specify a timeframe, severely limiting precision. Furthermore, there was considerable variability among those that did specify a timeframe, ranging from a week to a year. Though the authors did not analyse the extent to which variable timeframes might moderate prevalence rates, they did highlight the inherent challenges associated with different timeframes (e.g. shorter timeframes such as the previous week prompt more accurate recall but lack representativeness; longer timeframes such as one year may be more representative but can be subject to severe recall bias). Thus, measurement clearly matters, but measurement strategies in the field are inconsistent, hampering progress (Vivolo-Kantor et al., 2014).

## Inequalities in Bullying Exposure

A parallel body of research has been undertaken to determine *who* is more likely to be bullied. These studies (Amos et al., 2020; Çalışkan et al., 2019; D'Urso & Symonds, 2023; Due et al., 2019; Esteban et al., 2020; Hosozawa et al., 2021; Lebrun-Harris et al., 2019; Markkanen et al., 2021; Pervanidou et al., 2019) have indicated that exposure to bullying can vary by a range of socio-demographic factors including age, sex, socio-economic status, body mass index, urbanicity, caregiving responsibilities, academic performance, special educational needs, and sexual

orientation. Such disparities are typically expressed as absolute (e.g. 3% difference in prevalence of victimisation between children, 24.1%, and adolescents, 21.1%; Lebrun-Harris et al., 2019) or relative (e.g. lower socio-economic status students 1.83× more likely to be exposed to bullying than their more affluent peers; Pervanidou et al., 2019) inequalities. However, these estimates rely on a binary classification (i.e. bullied vs not bullied) that is subject to the measurement issues noted above. We therefore do not know, for example, whether the presence and magnitude of inequalities in exposure to bullying among different socio-demographic groups vary by exposure threshold (i.e. the scoring rules that are applied to produce the 'bullied vs not bullied' classification, based on data derived from the measure), or indeed across different types of bullying (e.g. physical, relational, cyber).

## Bullying Exposure and Internalising Mental Health Difficulties

The concurrent and longer-term consequences of exposure to bullying are well established and include mental health difficulties, self-harm and suicidality, substance abuse, maladaptive health outcomes (e.g. obesity), poorer academic achievement, and reduced school connectedness (Arseneault, 2018; Halliday et al., 2021; Lereya et al., 2015; Moore et al., 2017; Wolke & Lereya, 2015). Two recent meta-analyses concluded that the available evidence for a causal association is among the strongest for internalising mental health difficulties (e.g. sadness, anxiety) (Christina et al., 2021; Moore et al., 2017). Accordingly, this outcome is the main focus of the current study. Expressions of the association between exposure to bullying and such difficulties are typically in the form of relative risk (e.g. bullied children are 2.3× more likely to meet diagnostic criteria for depression than those not bullied; Lereya et al., 2015) or the contribution of exposure to outcome (e.g. 7.8% of the burden of anxiety disorders are attributable to bullying victimisation; Jadambaa et al., 2020).

However, we still know relatively little about how these estimates vary by the aforementioned exposure threshold. In other words, is there a dose-response relationship between exposure to bullying and caseness of internalising mental health difficulties? Does any such relationship vary across different types of bullying? The aforementioned meta-analysis by Moore et al. (2017) provides some evidence that this is indeed the case in relation to relative risk (e.g. children 'sometimes' bullied are 1.78× more likely to meet diagnostic criteria for depression than those not bullied, compared to equivalent odds ratio of 3.26× for children 'frequently' bullied). Furthermore, given that the impact of exposure to bullying on internalising mental health difficulties is

unlikely to be uniform (e.g. Kim et al. (2018) found that exposure to cyberbullying was more strongly associated with internalising symptoms among females, compared to males), more research is needed that examines differences between at-risk groups.

## The Current Study

We build on and extend the existing evidence base in several ways, addressing key limitations and knowledge gaps outlined above. First, with regard to the basic issue of measurement variability, the current study complements existing meta-analytic evidence (e.g. Modecki et al., 2014) by using within-study sensitivity analyses (as opposed to between-study comparisons, which cannot account for confounds beyond the measurement approach used, such as sampling strategy) to examine the influence of key measurement decisions—the exposure threshold and specific types of bullying considered—on prevalence estimates, and the presence and magnitude of inequalities in exposure to bullying among different socio-demographic groups. Second, building on the work of Moore et al. (2017), we examine whether there is a relationship between levels and types of exposure to bullying and caseness of internalising mental health difficulties, while also providing new evidence in relation to the contribution of exposure to outcome (i.e. examining the extent to which the population attributable fraction of bullying victimisation on internalising mental health difficulties varies by exposure threshold and/or type of bullying). Finally, drawing together the above work on inequalities in exposure to bullying and the impact of bullying, we explore the extent to which the effects of bullying victimisation on internalising mental health difficulties vary among different at-risk socio-demographic groups (e.g. young people with special educational needs).

We addressed five research questions using a series of pre-registered analyses. The first aimed to address the prevalence of bullying (RQ1). Second, we investigated whether there are inequalities in bullying exposure among different socio-demographic groups (e.g. age, gender identity and sexual orientation, special educational needs, ethnicity, socio-economic disadvantage; RQ2). Third, we examined the extent to which exposure to bullying is associated with internalising symptoms (RQ3). Fourth, we investigated whether the effects of bullying victimisation on internalising symptoms vary across the above socio-demographic subgroups (RQ4). Finally, we sought to determine whether the findings relating to the aforementioned research questions are sensitive to researcher-led analytical decisions pertaining to exposure threshold and/or different types of bullying (RQ5).

## Method

### Design

#BeeWell uses a hybrid population cohort study design (Das-Munshi et al., 2020), with two main elements: (i) a truncated longitudinal study of participants tracked with annual data points from age 12–15 (i.e. from year 8 to year 9 to year 10 of secondary school; sample 1) and (ii) a cross-sectional study comprising annual data points for participants aged 14–15 (e.g. those in year 10 of secondary school at a given data point; sample 2). Our secondary analysis draws on the first annual wave of #BeeWell data collection (Autumn 2021), combining data from samples 1 and 2. The initial sample comprised $N = 37,978$ young people attending 165 secondary schools across the 10 Greater Manchester (GM) Local Authorities.

For the analyses reported herein, the sample was reduced to $N = 35,825$ young people attending 147 schools, based on the application of two key requirements. First, responses on the bullying and/or internalising symptoms measures were required (i.e. no respondents with data completely missing for both key outcome measures). Second, as we clustered data by school in our analyses, any schools with 5 or fewer respondents were removed, based on guidance on multi-level modelling (Newsom, 2019).

### Participants

#### Schools

One hundred forty-seven secondary schools across the 10 Local Authorities of Greater Manchester are represented in the current study. These schools' average size was 999 students, of whom 51% were male.

#### Students

Data from $N = 35, 825$ young people attending the above schools are represented in the current study. Linked administrative data indicated that 67.25% were White, 78% spoke English as their first language, 14.3% had at least one special educational need, 42.64% lived in one of the 20% most socio-economically deprived neighbourhoods in England, and the average age was 13 years and 6 months (mean age in months was 163.08 months ($\pm$ 12.53). In addition, survey data indicated that 29.45% identified as a gender and/or sexual minority. Their demographic characteristics are listed and described in more detail below (see 'Socio-demographic Subgroups' subsection in the 'Measures' section).

Analysis of the sample composition indicated that it closely mirrored the 11–16 population of both young people in GM and nationally, where comparable indicators were available, though with some differences in ethnic composition for the latter (somewhat higher proportion of Asian and lower proportion of White young people than across England, see Table S1).

### Measures

#### Bullying

Three items pertaining to bullying victimisation are included in the #BeeWell dataset, which were adapted from the Understanding Society Youth Questionnaire (Institute for Social & Economic Research, 2021) and the Health Behaviours in School-Aged Children survey (Currie et al., 2014), as follows:

1. How often do you get physically bullied at school? By this, we mean getting hit, pushed around, threatened, or having belongings stolen.
2. How often do you get bullied in other ways at school? By this, we mean getting called names, getting left out of games, or having nasty stories spread about you on purpose.
3. How often do you get cyber-bullied? By this, we mean someone sending mean text or online messages about you, creating a website making fun of you, posting pictures that make you look bad online, or sharing them with others.

These questions had the following response options: not bullied at all, not much (1–3 times in the last 6 months), quite a lot (more than 4 times in the last 6 months), and a lot (a few times every week).

In our analyses, we created a binary measure of bullied/not bullied (0 = not bullied; 1 = bullied). For our main bullying exposure threshold, participants who responded *quite a lot* or *a lot* on at least one of the three above questions asked were classified as 'bullied'; all other respondents were classified as 'not bullied'. In a sensitivity analysis, those who responded *quite a lot* or *a lot* on at least *two* out of the three above questions were classified as 'bullied', in order to produce estimates for those who were subject to 'polyaggression' (Modecki et al., 2014). In further sensitivity analyses, we also considered each bullying item separately (e.g. participants who responded *quite a lot* or *a lot* to the cyberbullying item), as it is plausible that there are distinct risk groups for these and/or that they yield differential effects on internalising mental health difficulties (Kim et al., 2018).

## Internalising Mental Health Difficulties

The #BeeWell study uses the 10-item emotional symptoms subscale of the Me and My Feelings (M&MF) measure (also known as Me and My School; Deighton et al., 2012). Respondents read a series of statements (e.g. 'I worry a lot') and endorse them on a three-point scale (Never, Sometimes, Always). This produces scores ranging from 0 to 20, with higher scores indicative of greater internalising symptoms. We dichotomised total scores, with those $\geq 10$ indicating borderline or clinically significant internalising symptoms (scores of 10 and 11 indicate borderline difficulties, and scores $\geq 12$ indicate clinically significant difficulties; Patalay et al., 2014). Although the M&MF measure can be scored continuously, we used bands in the current study given our interest in caseness (e.g. normal vs borderline/clinical difficulties) as a result of exposure to bullying. In our analytical sample, 27.21% ($N=9749$) of students (pooled across 10 imputed datasets) fell into the borderline or clinically significant bands.

## Socio-demographic Subgroups

Based on the evidence outlined earlier and their availability in the #BeeWell dataset, the following socio-demographic subgroups were included in analyses pertaining to inequalities in bullying exposure (RQ2) and outcomes (RQ4):

**LGBTQ+ Status** Gender diverse and/or sexual minority (LGBTQ+) status was derived using sex assigned at birth (derived from linked administrative data provided by GM Local Authorities), gender identity, and sexual orientation (survey response) data. We considered three categories:

- Cisgender heterosexual boys (reference group) (38.47%; $N=13,783$)
- Cisgender heterosexual girls (32.07%; $N=11,490$)
- LGBTQ+ (29.45%; $N=10,552$)

The LGBTQ+ group included those who identified as sexual minorities (e.g. gay, lesbian, bi/pansexual), gender diverse (e.g. non-binary, and/or self-reported gender is incongruent with sex assigned at birth, such as those born a boy who identify as a girl), or who indicated that they *describe themselves in another way* or *prefer not to say* on either the sexual orientation or gender identity survey items. Cisgender heterosexual boys and girls were those whose sex and gender were congruent with one another (e.g. born a boy and identify as a boy) and sexuality was reported as heterosexual.

**Special Educational Needs (SEN)** SEN status was derived from linked administrative data. We considered three categories:

- No special educational needs (reference group) (85.7%; $N=30,703$)
- Those with SEN who receive SEN support (12.28%; $N=4399$)
- Those with SEN who have an education, health, and care plan (2.02%; $N=723$)

The 'SEN support' stage of provision refers to those students who have been identified as having special educational needs and are supported by their school using a graduated approach that follows a four-stage cycle of Assess, Plan, Do, Review. The 'Education, Health and Care plan' stage of provision involves a needs assessment, following which a plan that identifies the educational, health, and care (EHC) needs of a given pupil is drawn up. This plan also outlines the additional support that will be put in place to meet those needs. Importantly, EHC plans involve more support than is available through the earlier stage of provision, and typically therefore involve allocation of additional budgetary resource.

**Ethnicity** Ethnicity was derived from linked administrative data, as follows:

- White (reference group) (67.25%; $N=24,093$)
- Asian (18.46%; $N=6613$)
- Black (5.18%; $N=1856$)
- Chinese (0.85%; $N=305$)
- Mixed (5.92%; $N=2120$)
- Any other ethnic group (2.34%; $N=838$)

**Age** Age was derived from linked administrative data. We considered two categories:

- Year 10, age 14–15 (reference group) (46.44%; $N=16,636$)
- Year 8, age 12–13 (53.56%; $N=19,189$)

**Socio-economic Disadvantage** Socio-economic disadvantage was derived from publicly available data on Index of Multiple Deprivation (IMD) scores by lower super output area (geographic units that cover approximately 650 households), linked via participants' residential postcodes. IMD is a measure of relative deprivation formed from data on seven domains (income, employment, health deprivation and disability, education, skills and training, crime, barriers to housing and services, and living environment). We used IMD quintiles, as follows:

- Quintile 1 (most deprived) (42.64%; $n=15,277$)
- Quintile 2 (19.61%; $n=7025$)
- Quintile 3 (12.01%; $n=4301$)
- Quintile 4 (13.57%; $n=4862$)

- Quintile 5 (least deprived, reference group) (12.17%; $n = 4360$)

## Analytic Strategy

In line with open science guidelines (Kathawalla et al., 2021), the analysis plan for the current study was registered and deposited on the Open Science Framework prior to analysis being undertaken (OSF project osf.io/ef6ty; Registration DOI https://doi.org/10.17605/OSF.IO/SRC83). A minor deviation from the pre-registered analysis plan should be noted: Chinese young people were combined with those of any other ethnic group for RQ4 due to convergence issues resulting from small numbers in the former group.

## Handling of Missing Data

In our analytical sample, overall missingness was 4% (across all variables in the dataset, with the missing data for individual variables ranging from 0% for year group to 7.8% for LGBTQ+ status). 4.6% of respondents had missing data for the physical bullying item, 4.8% had missing data for the relational bullying item, and 4.72% had missing data for the cyberbullying item. For the key bullying exposure (whether respondents were exposed to frequent bullying on at least one of the three bullying items), 4.16% of respondents had missing data. 7.72% of the analytical sample had missing data for the internalising symptom outcome.

We fitted a multi-level logistic regression model (individuals nested within schools), to identify predictors of missingness, with a binary response variable (i.e. complete = 0; incomplete = 1). Internalising symptom scores, LGBTQ+ status, SEN status, ethnicity, age, and IMD quintile were included as potential predictors of missingness. Results from this analysis indicated that missingness was conditional upon other observed variables (specifically, SEN status, ethnicity, year group, and IMD quintile; see Supplementary Table S2). Given, therefore, that data could be considered missing at random, multiple imputation was used to account for missing data.

Multiple imputations with chained equations were used to impute missing data, using the *jomoImpute* function from the R package *mitml* (Grund et al., 2021). The imputation model was clustered by school. Variables included in analysis models and auxiliary variables (such as questions surrounding experiences of discrimination and demographic variables such as language spoken in the home, drawn from the #BeeWell dataset) were used to inform the imputations. Consistent with guidance (White et al., 2011), the number of imputations exceeded the percentage of missing cases in the dataset (i.e. 10 imputed datasets given that missingness in our analysis sample averaged 4%). Analyses were conducted on each imputed dataset, with results pooled to give the overall model coefficients.

## Data Analysis

All analyses were conducted in Rstudio (Posit Team, 2023). Multi-level logistic regressions were conducted using the lme4 package (Bates et al., 2015), with a random effect of school on the intercept to account for school clusters. The statistical significance of overall logistic regression models was determined by comparing a model with all the predictors to a null model, using nested model comparisons for imputed data, using the method of Meng and Rubin (1992).

For RQ1 (prevalence), we report an overall estimate based on the main exposure threshold noted above. For RQ2 (inequalities), we fitted a multi-level logistic regression (individuals clustered within schools), with exposure to bullying (yes/no) as the response variable and LGBTQ+ status, SEN status, ethnicity, age, and IMD as explanatory variables. For RQ3 (association with internalising mental health difficulties), we first report the population attributable fraction (PAF) for the proportion of borderline/clinical internalising symptoms cases that can be attributed to bullying exposure. The PAF formula is $(O - E)/O$, where $O$ is the observed number of cases, and $E$ is the expected number of cases under no exposure. This was calculated using the following steps:

1. Calculate the percentage of all respondents who are exposed to bullying that are borderline/clinical internalising symptoms cases
2. Calculate the percentage of all respondents who are *not* exposed to bullying that are borderline/clinical internalising symptoms cases
3. Calculate the attributable fraction (the percentage of borderline/clinical internalising symptoms in the exposed group that can be attributed to the exposure):

$$\frac{\text{risk score for the unexposed } - \text{ risk score for the exposed}}{\text{risk score for the exposed}}$$

4. Calculate the percentage of cases in the overall study sample that can be attributed to the exposure (the PAF): calculate the percentage of overall borderline/clinical internalising symptoms cases that were exposed to bullying
5. To calculate the PAF, multiply this result by the attributable fraction calculated in step 3

We then fitted a second multi-level logistic regression model with internalising symptoms as the outcome (dichotomised at $\geq 10$ to indicate borderline or clinical difficulties), to determine whether exposure to bullying predicted internalising symptoms caseness. This allowed us to produce odds ratios for internalising symptoms caseness based on bullying exposure (bullied vs not bullied),

while adjusting for the socio-demographic characteristics noted above and accounting for data clustering (i.e. the intra-class correlation coefficient).

For RQ4 (subgroup moderator effects), the multi-level logistic regression model noted above was extended by fitting bullying $\times$ group interaction terms (e.g. bullied $\times$ LGBTQ+ status). Odds ratios for the interaction terms were calculated using the formulae outlined in Chen (2003). For example, to calculate the odds ratio for bullied cisgender heterosexual girls experiencing borderline/clinical internalising symptoms compared to bullied cisgender heterosexual boys (reference category), the following formula was used:

$$\widehat{OR} = \frac{Odds \, \text{for} \left( I_{bullied} = 1 \text{ and } I_{\text{LGBTQ+ status}} = 1 \right)}{Odds \, \text{for} \left( I_{bullied} = 1 \text{ and } I_{\text{LGBTQ+ status}} = 0 \right)}$$

$$= \exp\left( \widehat{\beta}_{\text{cisgender heterosexual girl}} + \widehat{\beta}_{\text{bullied} \times \text{cisgender heterosexual girl}} \right)$$

Ninety-five percent confidence intervals for the interaction terms derived using the above formula were calculated as follows:

$$Lower \, CI = \exp((\beta_{\text{cisgender heterosexual girl}} + \beta_{\text{bullied} \times \text{cisgender heterosexual girl}})$$
$$- 1.96 \times (SE_{\text{cisgender heterosexual girl}} + SE_{\text{bullied} \times \text{cisgender heterosexual girl}}))$$

$$Upper \, CI = \exp((\beta_{\text{cisgender heterosexual girl}} + \beta_{\text{bullied} \times \text{cisgender heterosexual girl}})$$
$$+ 1.96 \times (SE_{\text{cisgender heterosexual girl}} + SE_{\text{bullied} \times \text{cisgender heterosexual girl}}))$$

Finally, for RQ5 (sensitivity analyses), we repeated the above analyses, first with a more stringent exposure threshold (those who responded quite a lot or a lot on *at least 2 out of the 3* bullying questions were classified as bullied), and then separately for each bullying item, using the main exposure threshold noted earlier.

## Results

Results are organised below by RQ, with the exception of RQ5 (sensitivity analyses), which is integrated into the commentary in each substantive section (e.g. sensitivity analyses pertaining to prevalence are reported as part of the RQ1 section, and so on).

### RQ1. What Is the Prevalence of Bullying?

Bullying victimisation prevalence estimates are found in Table 1. These estimates were pooled across the 10 imputed datasets. 15.56% of young people report being bullied in at least one of the three domains. As can be seen from Table 1, using the more stringent exposure threshold of at least two of

**Table 1** Prevalence of bullying victimisation based on different bullying exposure thresholds and each domain of bullying ($N = 35,825$)

| Bullying exposure | Proportions (%) |
|---|---|
| **Bullied on at least one domain** | |
| Not bullied | 84.44 |
| Bullied | 15.56 |
| **Bullied on at least two domains** | |
| Not bullied | 94.22 |
| Bullied | 5.78 |
| **Physical bullying** | |
| Not bullied | 93.69 |
| Bullied | 6.31 |
| **Relational bullying** | |
| Not bullied | 87.97 |
| Bullied | 12.03 |
| **Cyberbullying** | |
| Not bullied | 95.43 |
| Bullied | 4.57 |

Proportions pooled across 10 imputed datasets

the three domains decreases the proportion of young people exposed to bullying victimisation by almost 10%. When the bullying domains are considered separately, approximately twice as many young people report being exposed to relational bullying when compared to physical or cyberbullying. These prevalence estimates suggest that using more stringent exposure thresholds for bullying may result in the prevalence of bullying being underestimated. They also indicate that relational bullying is far more prevalent than physical or cyberbullying. Thus, with reference to RQ5, we conclude that the prevalence of bullying is sensitive to both the stringency of the exposure threshold and specific type of bullying that is being considered.

### RQ 2. Are There Inequalities in Exposure to Bullying?

Table 2 details the findings of a series of multi-level logistic regression models with bullying exposure as the response variable and socio-demographic subgroups as explanatory variables. These analyses reveal a number of patterns pertaining to inequalities in exposure to bullying and the sensitivity (or lack thereof) of these inequalities to varying the exposure threshold or considering specific types of bullying (RQ5). First, LGBTQ+young people are significantly more likely than the cisgender heterosexual boys reference group to be exposed to bullying (OR = 2.58, $p < .001$). Regarding RQ5, these effects are not sensitive to varying the exposure threshold to at least two domains, or when considering specific types of bullying. The magnitude of this inequality is consistent across most models with an OR $\geq$ 2.5, with a minor exception being physical bullying (OR = 2.08). In

**Table 2** Multi-level logistic regression models predicting bullying exposure, with socio-demographic subgroups as explanatory variables (N=35,825)

| Socio-demographic subgroup | Odds ratio (95% CIs); *p* value | | | | |
|---|---|---|---|---|---|
| | Frequent bullying | | Individual domains | | |
| | Bullied on at least one domain | Bullied on at least two domains | Physical bullying | Relational bullying | Cyberbullying |
| **LGBTQ+ status** | | | | | |
| Cisgender heterosexual boy | Reference | Reference | Reference | Reference | Reference |
| Cisgender heterosexual girl | 1.19 [1.10; 1.29]*** *p*<.001 | 1.08 [.94; 1.23] *p*=.270 | .82 [.72; .93]*** *p*<.001 | 1.33 [1.22; 1.46]*** *p*<.001 | 1.20 [1.03; 1.40]* *p*=.020 |
| LGBTQ+ | 2.58 [2.38; 2.78]*** *p*<.001 | 2.54 [2.27; 2.85]*** *p*<.001 | 2.08 [1.88; 2.30]*** *p*<.001 | 2.75 [2.53; 3.00]*** *p*<.001 | 2.76 [2.43; 3.14]*** *p*<.001 |
| **Special educational needs** | | | | | |
| No SEN | Reference | Reference | Reference | Reference | Reference |
| SEN support | 1.37 [1.26; 1.49]*** *p*<.001 | 1.66 [1.47; 1.88]*** *p*<.001 | 1.71 [1.52; 1.92]*** *p*<.001 | 1.34 [1.21; 1.47]*** *p*<.001 | 1.25 [1.08; 1.44]*** *p*<.001 |
| EHC plan | 1.45 [1.19; 1.75]*** *p*<.001 | 1.91 [1.49; 2.46]*** *p*<.001 | 1.93 [1.51; 2.46]*** *p*<.001 | 1.31 [1.06; 1.63]** *p*=.010 | 1.77 [1.34; 2.33]*** *p*<.001 |
| **Ethnic group** | | | | | |
| White | Reference | Reference | Reference | Reference | Reference |
| Asian | .59 [.53; .65]*** *p*<.001 | .64 [.55; .74]*** *p*<.001 | .71 [.61; .81]*** *p*<.001 | .57 [.51; .64]*** *p*<.001 | .61 [.51; .72]*** *p*<.001 |
| Black | .76 [.65; .89]*** *p*<.001 | .72 [.56; .92]** *p*=.010 | .85 [.68; 1.07] *p*=.170 | .65 [.54; .77]*** *p*<.001 | .93 [.72; 1.20] *p*=.570 |
| Chinese | .58 [.40; .86]** *p*=.010 | .33 [.14; .81]* *p*=.020 | .50 [.26; .97]* *p*=.040 | .51 [.33; .79]*** *p*<.001 | .57 [.29; 1.12] *p*=.100 |
| Mixed | .77 [.67; .88]*** *p*<.001 | .74 [.58; .94]** *p*=.010 | .85 [.69; 1.05] *p*=.130 | .73 [.62; .85]*** *p*<.001 | .79 [.62; 1.02] *p*=.070 |
| Any other ethnic group | .85 [.69; 1.05] *p*=.140 | .94 [.68; 1.29] *p*=.700 | .98 [.72; 1.34] *p*=.900 | .82 [.65; 1.03] *p*=.090 | .91 [.64; 1.30] *p*=.610 |
| **Age** | | | | | |
| Year 10 | Reference | Reference | Reference | Reference | Reference |
| Year 8 | 1.30 [1.22; 1.38]*** *p*<.001 | 1.21 [1.10; 1.33]*** *p*<.001 | 1.27 [1.16; 1.40]*** *p*<.001 | 1.22 [1.14; 1.30]*** *p*<.001 | 1.17 [1.05; 1.30]*** *p*<.001 |
| **IMD** | | | | | |
| Quintile 5 (least deprived) | Reference | Reference | Reference | Reference | Reference |
| Quintile 4 | 1.06 [.93; 1.21] *p*=.400 | 1.05 [.85; 1.29] *p*=.660 | 1.15 [.94; 1.40] *p*=.170 | 1.07 [.92; 1.24] *p*=.390 | .98 [.78; 1.24] *p*=.860 |
| Quintile 3 | 1.24 [1.09; 1.42]*** *p*<.001 | 1.34 [1.09; 1.65]*** *p*<.001 | 1.40 [1.15; 1.71]*** *p*<.001 | 1.21 [1.05; 1.41]** *p*=.010 | 1.19 [.94; 1.50] *p*=.150 |
| Quintile 2 | 1.24 [1.10; 1.41]*** *p*<.001 | 1.41 [1.16; 1.72]*** *p*<.001 | 1.41 [1.17; 1.70]*** *p*<.001 | 1.24 [1.09; 1.43]*** *p*<.001 | 1.24 [1.02; 1.52]* *p*=.030 |
| Quintile 1 (most deprived) | 1.29 [1.15; 1.46]*** *p*<.001 | 1.49 [1.24; 1.79]*** *p*<.001 | 1.53 [1.28; 1.82] ***p*<.001 | 1.29 [1.13; 1.48]*** *p*<.001 | 1.32 [1.08; 1.60]** *p*=.010 |
| Intra-class correlation | .07 | .09 | .10 | .07 | .05 |
| Nagelkerke $R^{2a}$ | .058 | .049 | .046 | .054 | .041 |
| Overall significance of model[b] | Dm(14, 12,234.24)=79.74, *p*<.001) | Dm(14, 9631.86)=41.97, *p*<.001 | Dm(14, 12,416.87)=41.45, *p*<.001 | Dm(14, 13,394.9)=66.48, *p*<.001 | Dm(14, 10,004.4)=30.06, *p*<.001 |

Note that 95% confidence intervals for odds ratios never cross 1 for significant effects

*p*<.05; **p*<.01; ***p*<.001

[a]Nagelkerke $R^2$ pooled across the 10 imputed datasets

[b]The overall significance of the model was established by comparing the full model to the null model, using the multivariate Wald test, following the method outlined for imputed datasets by Meng and Rubin (1992). Dm is the wald test statistic for this method. *p*<.05 indicates an improved model fit compared to the null model

contrast, inequalities between cisgender heterosexual girls and cisgender heterosexual boys appear to be sensitive to both varying the exposure threshold and when considering specific types of bullying. Thus, cisgender heterosexual girls are significantly more likely than cisgender heterosexual boys to be bullied in at least one domain (OR = 1.19, $p < .001$), but no more or less likely to be bullied in at least two domains ($p > .05$). In terms of bullying type, cisgender heterosexual girls are significantly *more* likely than cisgender heterosexual boys to experience relational (OR = 1.33, $p < .001$) or cyber (OR = 1.2, $p < .05$) bullying, but significantly *less* likely to experience physical bullying (OR = .82, $p < .001$).

Second, students with SEN at the SEN support stage (OR = 1.37, $p < .001$) and those with EHC plans (OR = 1.45, $p < .001$) are significantly more likely than those without SEN to be exposed to bullying. Considering RQ5, these effects are not sensitive to varying the exposure threshold or considering specific types of bullying. With the exception of relational bullying, there is also consistency in terms of somewhat higher ORs for students in receipt of EHC plans (OR range 1.45 to 1.91) than those at the SEN support stage of provision (OR range 1.25 to 1.71).

Third, with the exception of those from any other ethnic group, students from minority ethnic backgrounds (e.g. Asian, Black) are significantly *less* likely to be bullied in at least one domain than the reference group of White students (OR range .58 to .77, all $p < .05$). In terms of RQ5, these effects are not sensitive to varying the exposure threshold to at least two domains, or when considering relational bullying specifically. However, with a couple of minor exceptions, the inequalities are not evident when considering physical bullying (except for Chinese students, OR = .5, $p < .05$) and cyberbullying (except Asian students, OR = .61, $p < .001$) specifically. In other words, students from most minority ethnic backgrounds are no more or less likely to be physically or cyberbullied than White students.

Fourth, younger students are significantly more likely to be bullied than older students (OR = 1.3, $p < .001$). Regarding RQ5, this effect is not sensitive to varying the exposure threshold to at least two domains, or when considering specific types of bullying.

Finally, with the exception of IMD quintile 4, students living in more deprived neighbourhoods are significantly more likely to be bullied than those living in the least deprived neighbourhoods (OR range 1.24 to 1.29, all $p < .001$). Considering RQ5, these effects are not sensitive to varying the exposure threshold to at least two domains, or when considering specific types of bullying (with the exception of IMD quintile 3 for cyberbullying). However, in terms of the magnitude of effects, it is worthy of note that the ORs for physical bullying (range 1.4 to 1.53) are somewhat larger than for relational (OR range 1.21 to 1.29) or cyberbullying (range 1.24 to 1.32).

## RQ3. How Is Exposure to Bullying Associated with Mental Health Outcomes?

Approximately 27% of young people in the #BeeWell sample experience significant internalising symptoms (scores ≥ 10). Our population attributable fraction (PAF) estimate indicates that 18.8% of these cases can be attributed to being bullied on at least one of the three domains. In relation to RQ5, when bullying is considered based on an exposure threshold of at least two of the domains, the PAF estimate drops to 7.5%. Turning to each bullying domain considered separately, PAF estimates are 7% for physical bullying exposure, 14.9% for relational bullying exposure, and 5.9% for cyberbullying exposure.

While PAF estimates indicate the percentage of cases of significant internalising symptoms (scores ≥ 10) that can be attributed to bullying exposure, in the form used above, they do not account for the effect of potential confounding variables. We therefore fitted a series of multi-level logistic regression models (see Table 3) that would enable us to do so. Inspection of Table 3 shows that after accounting for the potential confounding influence of a range of socio-demographic covariates (e.g. socio-economic deprivation, special educational needs), being bullied was significantly associated with internalising symptom caseness (OR = 3.92, $p < .001$). Considering RQ5, these effects are not sensitive to varying the exposure threshold to at least two domains, or when considering specific types of bullying. However, it is worth noting the somewhat higher OR when the exposure threshold is at least two domains (4.2) as opposed to one (3.92).

## RQ4: Do the Effects of Bullying Victimisation on Internalising Symptoms Vary by Socio-demographic Subgroup?

To answer RQ4, the models described above (RQ3) were extended, with bullying × group status interaction terms (e.g. bullied × LGBTQ+ status) added. In the interests of brevity and clarity, we do not report the full models here (these are available in Supplementary Table S3), but rather we simply note the presence of interaction effects that would be indicative of effect moderation. In most cases, we found no significant interactions, indicating relative uniformity in the association between bullying exposure and internalising symptoms caseness among socio-demographic subgroups. However, there were notable exceptions to this, namely in relation to LGBTQ+ status and ethnicity.

With regard to LGBTQ+ status, bullied cisgender heterosexual girls (OR = 2.45) and bullied LGBTQ+ young people (OR = 3.92) are significantly more likely to experience borderline/clinical internalising symptoms than bullied cisgender heterosexual boys. This overall pattern was consistent

**Table 3** Multi-level logistic regression models predicting negative affect caseness, with bullying exposure and socio-demographic subgroups as explanatory variables ($N = 35,825$)

| Variable | Odds ratio (95% CIs); $p$ value | | | | |
| --- | --- | --- | --- | --- | --- |
| | Frequent bullying | | Individual domains | | |
| | Bullied on at least one domain | Bullied on at least two domains | Physical bullying | Relational bullying | Cyberbullying |
| Bullying exposure | 3.92 [3.66; 4.20]*** $p<.001$ | 4.20 [3.79; 4.64]*** $p<.001$ | 3.55 [3.21; 3.93]*** $p<.001$ | 3.83 [3.55; 4.13]*** $p<.001$ | 3.93 [3.49; 4.42]*** $p<.001$ |
| **Socio-demographic covariates** | | | | | |
| **LGBTQ+ status** | | | | | |
| Cisgender heterosexual boy | Reference | Reference | Reference | Reference | Reference |
| Cisgender heterosexual girl | 3.45 [3.19; 3.73]*** $p<.001$ | 3.43 [3.17; 3.70]*** $p<.001$ | 3.48 [3.22; 3.75]*** $p<.001$ | 3.37 [3.12; 3.64]*** $p<.001$ | 3.39 [3.14; 3.66]*** $p<.001$ |
| LGBTQ+ | 5.20 [4.81; 5.62]*** $p<.001$ | 5.54 [5.13; 5.98]*** $p<.001$ | 5.62 [5.20; 6.07]*** $p<.001$ | 5.25 [4.86; 5.67]*** $p<.001$ | 5.56 [5.15; 6.00]*** $p<.001$ |
| **Special educational needs** | | | | | |
| No SEN | Reference | Reference | Reference | Reference | Reference |
| SEN support | .92 [.85; 1.00]* $p=.050$ | .93 [.86; 1.01] $p=.100$ | .93 [.86; 1.01] $p=.100$ | .94 [.86; 1.02] $p=.130$ | .97 [.90; 1.06] $p=.510$ |
| EHC plan | .87 [.71; 1.07] $p=.190$ | .88 [.72; 1.07] $p=.190$ | .88 [.72; 1.07] $p=.190$ | .91 [.75; 1.11] $p=.360$ | .90 [.74; 1.10] $p=.310$ |
| **Ethnicity** | | | | | |
| White | Reference | Reference | Reference | Reference | Reference |
| Asian | .68 [.63; .74]*** $p<.001$ | .65 [.60; .70]*** $p<.001$ | .64 [.59; .69]*** $p<.001$ | .67 [.62; .73]*** $p<.001$ | .64 [.59; .70]*** $p<.001$ |
| Black | .72 [.63;.83]*** $p<.001$ | .71 [.62;.81]*** $p<.001$ | .70 [.61;.80]*** $p<.001$ | .74 [.64;.84]*** $p<.001$ | .69 [.61;.79]*** $p<.001$ |
| Chinese | 1.04 [.79;1.37] $p=.780$ | 1.00 [.76;1.31] $p=.990$ | .98 [.74;1.29] $p=.880$ | 1.04 [.79;1.36] $p=.800$ | .97 [.74;1.27] $p=.830$ |
| Mixed | .88 [.78;.98]* $p=.020$ | .86 [.77;.96]** $p=.010$ | .85 [.76;.95]*** $p<.001$ | .88 [.78;.98]* $p=.020$ | .85 [.76;.95]*** $p<.001$ |
| Any other ethnic group | .80 [.66;.97]* $p=.020$ | .79 [.65;.95]** $p=.010$ | .78 [.65;.94]** $p=.010$ | .80 [.67;.97]* $p=.020$ | .78 [.65;.94]** $p=.010$ |
| **Age** | | | | | |
| Year 10 | Reference | Reference | Reference | Reference | Reference |
| Year 8 | .75 [.71;.79]*** $p<.001$ | .78 [.74;.83]*** $p<.001$ | .78 [.74;.83]*** $p<.001$ | .77 [.73;.81]*** $p<.001$ | .79 [.75;.83]*** $p<.001$ |
| **IMD** | | | | | |
| Quintile 5 (least deprived) | Reference | Reference | Reference | Reference | Reference |
| Quintile 4 | 1.02 [.92;1.14] $p=.670$ | 1.03 [.93;1.14] $p=.610$ | 1.02 [.92;1.13] $p=.730$ | 1.02 [.92;1.14] $p=.660$ | 1.03 [.93;1.14] $p=.540$ |
| Quintile 3 | 1.11 [.99;1.24] $p=.080$ | 1.12 [1.01;1.25]* $p=.040$ | 1.12 [1.00;1.25]* $p=.040$ | 1.12 [1.00;1.25]* $p=.050$ | 1.14 [1.02;1.27]* $p=.020$ |
| Quintile 2 | 1.14 [1.03;1.26]** $p=.010$ | 1.15 [1.04;1.28]** $p=.010$ | 1.15 [1.04;1.28]** $p=.010$ | 1.15 [1.04;1.27]** $p=.010$ | 1.17 [1.06;1.30]*** $p<.001$ |
| Quintile 1 (most deprived) | 1.14 [1.03;1.25]** $p=.010$ | 1.15 [1.05;1.27]*** $p<.001$ | 1.15 [1.05;1.27]*** $p<.001$ | 1.15 [1.04;1.26]*** $p<.001$ | 1.17 [1.07;1.29]*** $p<.001$ |
| Intra-class correlation | .09 | .09 | .09 | .09 | .09 |
| Nagelkerke $R^{2a}$ | .194 | .16 | .156 | .181 | .153 |
| Overall significance of model[b] | Dm(15, 7943.62)=249.58, $p<.001$ | Dm(15, 8836.64)=207.19, $p<.001$ | Dm(15, 8383.29)=201.52, $p<.001$ | Dm(15, 8322.05)=234.34, $p<.001$ | Dm(15, 8135.43)=197.63, $p<.001$ |

Note that 95% confidence intervals for odds ratios never cross 1 for significant effects

*$p<.05$; **$p<.01$; ***$p<.001$

[a]Nagelkerke $R^2$ pooled across the 10 imputed datasets

[b]The overall significance of the model was established by comparing the full model to the null model, using the multivariate Wald test, following the method outlined for imputed datasets by Meng and Rubin (1992). Dm is the wald test statistic for this method. $p<.05$ indicates an improved model fit compared to the null model

when varying the bullying exposure threshold and specific type of bullying being considered (see Fig. 1 and Supplementary Table S4). A notable exception is cyberbullying, which appears to be particularly harmful to LGBTQ+ students' mental health (compared to cisgender heterosexual boys; OR = 4.28 compared to 3.95 for relational bullying and 3.28 for physical bullying).

In relation to ethnicity, a significant interaction effect was observed for Black students only (Fig. 2 and Supplementary Table S5). Bullied Black students are significantly less likely to experience borderline/clinical internalising symptoms than bullied White students (OR = .52). A similar pattern was observed for exposure to relational bullying. However, when the bullying exposure threshold is varied to include being bullied on at least two domains, or when considering physical and cyberbullying, no significant interactions were observed for Black students.

## Discussion

The aim of the current study was to advance knowledge and understanding of the prevalence, inequalities, and impact of bullying in adolescence, with a particular focus on the sensitivity of findings to key researcher-led analytic decisions pertaining to the exposure threshold and specific types of bullying being considered. Using pre-registered secondary analyses of the #BeeWell dataset, we established that the prevalence of bullying was 15.56% using our main exposure threshold, but this dropped to as low as 4.57% (for cyberbullying) in sensitivity analyses. In terms of inequalities, we found consistent evidence that gender and sexual minorities, younger students, those with SEN, and those from socio-economically disadvantaged neighbourhoods were significantly more likely to be exposed to bullying than their peers. However, the presence and magnitude of inequalities in bullying exposure among cisgender heterosexual girls and most ethnic minority groups were sensitive to varying the exposure threshold and specific type of bullying being considered.

With regard to the impact of bullying, our analyses demonstrated that the population attributable fraction of bullying exposure on internalising mental health symptoms caseness was 18.8% using our main exposure threshold (exposure in at least one domain), but this dropped as low as 5.9% (for cyberbullying) in sensitivity analyses. By contrast, the odds ratio pertaining to the exposure-outcome association was relatively consistent, being 3.92 in our main analysis and remaining at or around this value in most sensitivity analyses (though with the notable exception of varying the exposure threshold to include students being victimised in at least two domains, where it grew to 4.2). Finally, our subgroup moderator analyses revealed relative uniformity in the association between bullying exposure and internalising symptoms caseness among socio-demographic subgroups, indicating that exposure to bullying has the same detrimental impact on mental health, regardless of the socio-demographic characteristics of the victim. However, there were notable exceptions in terms of gender/sexuality (bullying exposure more strongly associated with internalising symptoms caseness among LGBTQ+ young people and cisgender heterosexual girls than cisgender heterosexual boys) and ethnicity (bullying exposure less strongly associated with internalising symptoms caseness among Black students than White students).

## Prevalence: Measurement Matters

Our main prevalence estimate (RQ1) of 15.56% being exposed to at least one form of bullying is remarkably consistent with the average prevalence rate (15.17%) reported among Australian children and adolescents in Jadambaa et al.'s (2019) meta-analysis, in addition to Caliskan et al.'s recent (2019) study of Turkish 12–15 year olds (15.9%). By contrast, it is significantly lower than the 35% prevalence rate reported in Modecki et al.'s (2014) earlier meta-analysis. However, those authors drew from a broad international corpus of studies to arrive at their estimates, and it is known that prevalence varies significantly by country and culture (Hosozawa et al., 2021; indeed, one included study reported a prevalence rate of > 90%). Furthermore, relative timing may be a factor, since other researchers have reported decreasing prevalence rates in the last two decades (Due et al., 2019). Finally, the bullying items used in the current study included two features found by Modecki et al. (2014) to reduce prevalence estimates: providing behavioural examples and directly referencing bullying (see the 'Method' section).

Our principal sensitivity analysis, in which the exposure threshold was modified to include students being victimised in at least two domains, extends current understanding by demonstrating that the prevalence rate of exposure to 'polyaggression' (Modecki et al., 2014) is comparatively rare, at less than 6%. In terms of specific forms of bullying, we found traditional forms (e.g. relational) to be much more prevalent than cyberbullying, in common with much of the contemporary literature (Hosozawa et al., 2021; Jadambaa et al., 2019; Modecki et al., 2014). Accordingly, we are minded to agree with the late Dan Olweus, who argued that 'research on cyberbullying is plagued by… exaggerated claims about prevalence' (Olweus & Limber, 2018, p. 139); though like him, we do not intend to downplay the *consequences* of cyberbullying (an issue to which we will return). In sum, our analyses demonstrated clearly that the prevalence of bullying is sensitive to varying both the exposure threshold and specific type of bullying being considered (RQ5).
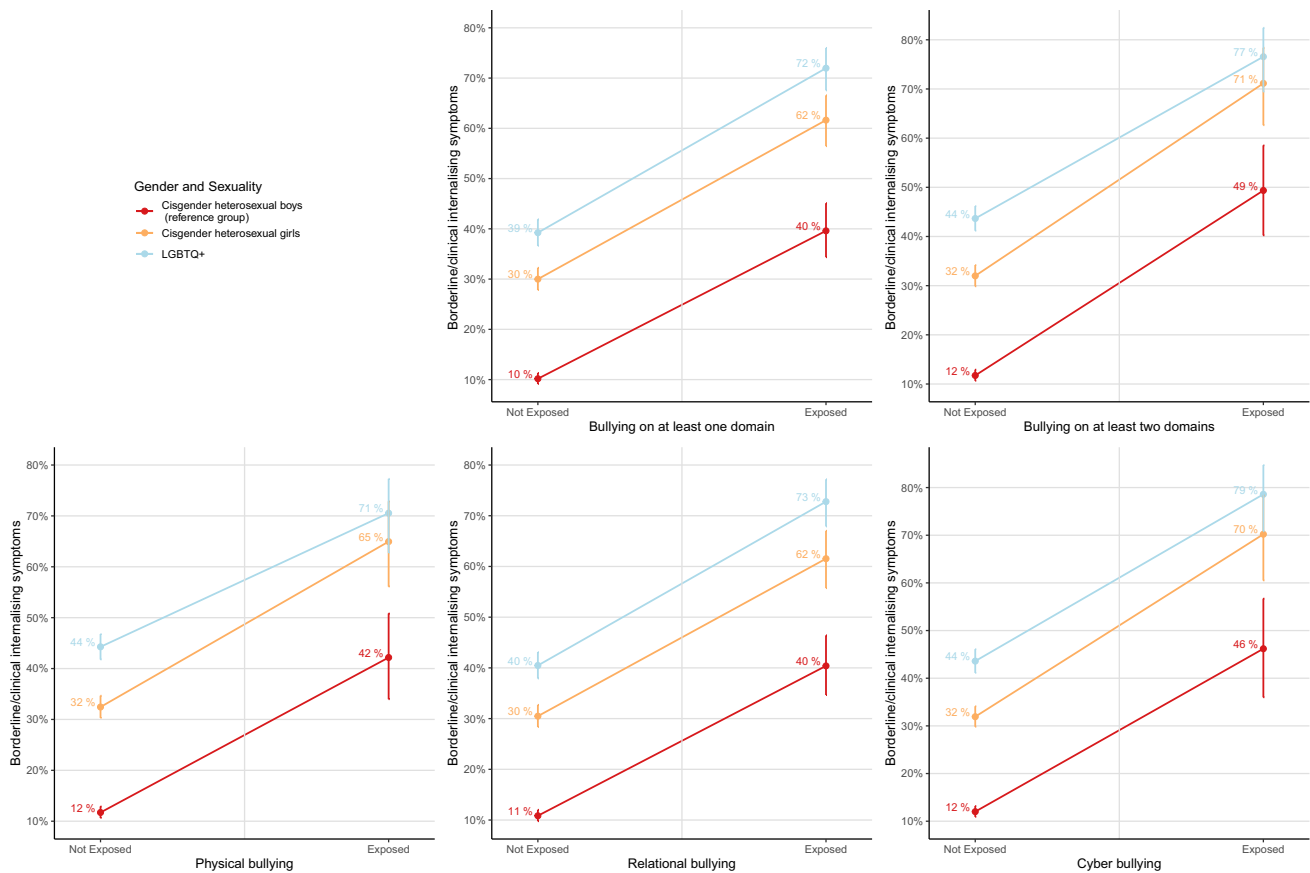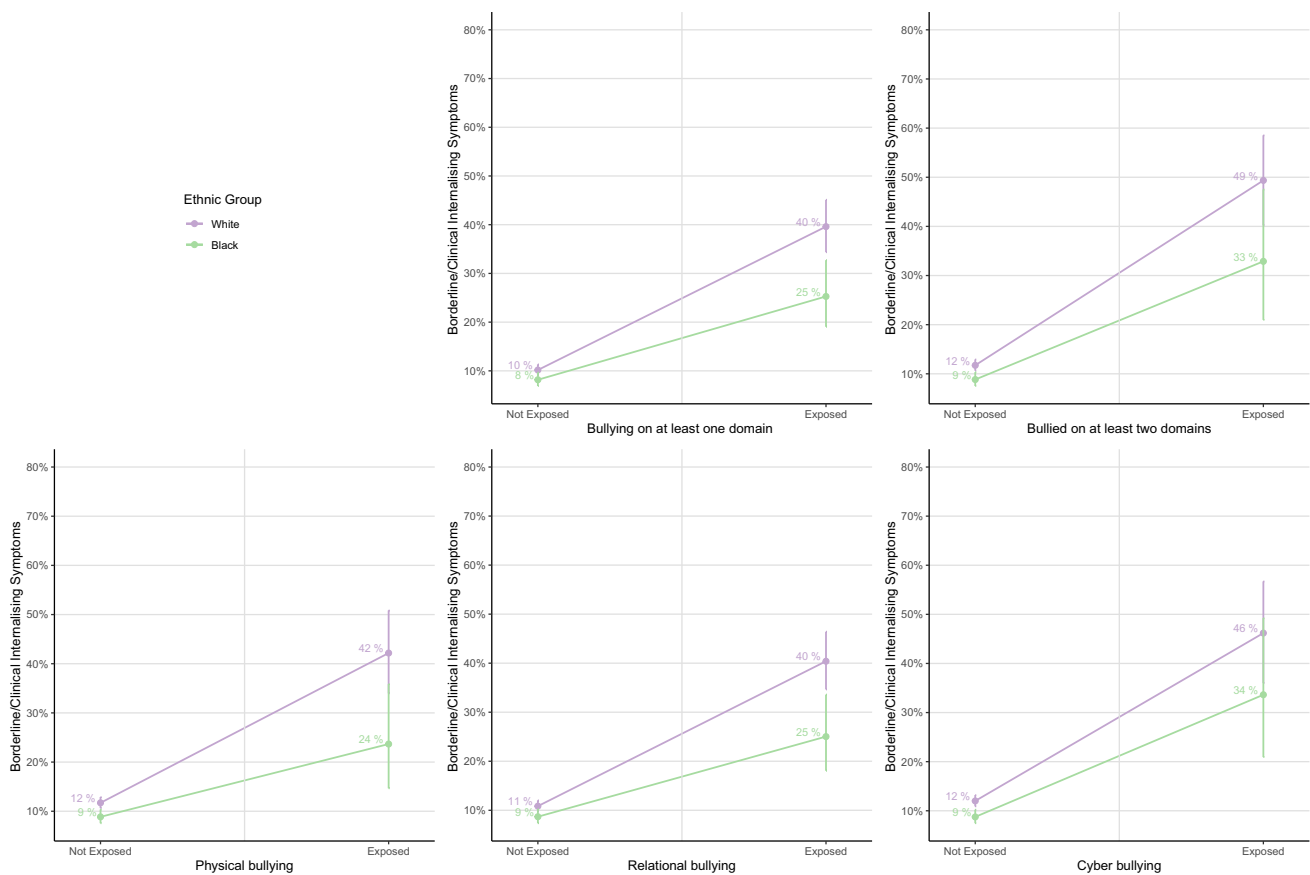
**Fig. 1** Predicted probabilities of experiencing borderline/clinical internalising symptoms as a result of bullying exposure among young people in different gender and sexuality groups

## Inequalities in Bullying Exposure: The Importance of Measurement

Our analyses also demonstrated that some previously established inequalities in bullying exposure (RQ2) vary by exposure threshold and/or type of bullying, whereas others were insensitive to these researcher-led analytical decisions. Interestingly, those socio-demographic characteristics where we found most consistent evidence of disparities aligned well with the existing evidence base—for example, significantly higher rates of victimisation among those who identified as LGBTQ+ (Amos et al., 2020; D'Urso & Symonds, 2023), younger students (Lebrun-Harris et al., 2019; Markkanen et al., 2021; Pervanidou et al., 2019), those with SEN (D'Urso & Symonds, 2023; Esteban et al., 2020; Lebrun-Harris et al., 2019), and respondents from socio-economically disadvantaged neighbourhoods (Due et al., 2019; Hosozawa et al., 2021; Markkanen et al., 2021).

By contrast, the two key characteristics where inequalities varied across our main and sensitivity analyses were less well aligned with the findings of previous studies. Thus, with regard to gender, our main analysis revealed that

cisgender heterosexual girls were more likely to be bullied than cisgender heterosexual boys (one at least one domain), in direct contrast to several studies that have found the converse (e.g. Çalışkan et al., 2019; D'Urso & Symonds, 2023; Hosozawa et al., 2021). However, we note the evidence of high levels of heterogeneity reported in a recent international meta-analysis, indicating that the direction of male–female disparities in bullying exposure varies across countries/cultures (Hosozawa et al., 2021). Furthermore, the specific types of bullying considered in said studies may play a role. For example, while Markkanen et al. (2021) research with Finnish adolescents revealed no overall differences in victimisation between males and females, the authors did report higher rates of exposure to physical bullying among males and relational bullying among females, as was found in the current study. Furthermore, our gender data were combined with sexual orientation data in order to create the 'LGBTQ+' group. Our 'male' group was therefore specifically *cisgender heterosexual* boys. In other studies, gender is typically considered as a binary male–female variable, with sexual orientation considered separately (or not at all), meaning that *sexual minority* boys, who we might expect to

**Fig. 2** Predicted probabilities of experiencing borderline/clinical internalising symptoms as a result of bullying exposure among young people belonging to White or Black ethnic groups

report higher rates of bullying exposure, would be captured in the 'male' group in such studies.

With regard to ethnicity, recall that we found that students from ethnic minority backgrounds were significantly *less* likely to experience bullying than their White counterparts in our main analysis (at least one domain), principal sensitivity analysis (at least two domains), and also when considering relational bullying specifically; with the exception of Chinese students for physical bullying, ethnic minority students were no more or less likely than White students to experience other types of bullying. Our findings broadly align with those of Tippett et al. (2013), who also used a UK sample, and Webb et al.'s (2021) study of high school students in the USA. However, findings contrast with other recent research findings, such as that of D'Urso and Symonds (2023; systematic literature review focusing on Irish children and adolescents) and Lebrun-Harris et al. (2019; focusing on adolescents in the USA), which both found that ethnic minority students were significantly *more* likely to be bullied than their White counterparts. Further work is required to determine the source(s) of these contrasting findings, as current evidence is far from consistent, as

highlighted by a review of empirical research by Xu et al. (2020). Future research should seek to determine the factors that underpin the direction of any observed ethnic inequalities in bullying victimisation, including, for example, the ethnic composition of school classes (Vervoort et al., 2010) intersectionality with other aspects of young people's identities (De Pedro et al., 2019), and/or social-ecological, ethnic identity, and cultural factors that may serve as risk or protective factors for young people from ethnic minorities (Xu et al., 2020).

## The Impact of Bullying Exposure on Internalising Symptoms: The Role of Measurement

Turning to the impact of being exposed to bullying in adolescence, our analyses align with the pre-existing literature: those who were bullied were significantly more likely to experience borderline/clinical levels of internalising symptoms, compared to those who were not bullied (Christina et al., 2021; Lereya et al., 2015; Moore et al., 2017). Further, the population attributable fraction of our main bullying exposure on internalising mental health symptoms

caseness indicates that almost 19% of significant internalising symptoms were attributable to being bullied in at least one domain. Together, these findings highlight the negative impact of bullying exposure but present a less consistent picture in terms of their sensitivity to researcher-led decisions regarding how one defines exposure to bullying. On the one hand, odds ratios were relatively consistent across the bullying exposure thresholds and types (3.92 in our main analysis and remaining similar in our sensitivity analyses).

One slight exception to the above is that the odds ratio increased to 4.2 when the exposure threshold was modified to include students being victimised in at least two domains. In relation to this, Modecki et al.'s (2014) finding that cyber and traditional (e.g. relational, physical) bullying were highly correlated may indicate that the most common form of polyaggression exposure is cyber and relational or physical bullying (as opposed to relational and physical). Traditional bullying typically occurs at school, whereas cyberbullying can take place anywhere, at any time, by anyone (Vaillancourt et al., 2017). This may have the effect of making polyaggression feel more 'inescapable' for victims, which could exacerbate the negative impact on their mental health. Somewhat relatedly, although the odds ratios for the three domains of bullying are similar, they are the largest for cyberbullying at 3.93. Similar findings were reported in Christina et al.'s (2021) meta-analysis: cyberbullying was a marginally stronger predictor of internalising difficulties than traditional bullying. The aforementioned inescapable nature of such victimisation, the fact that the bully's identity can remain anonymous, and that bullying episodes can be shared widely on the internet, likely contribute to these stronger effects (Vaillancourt et al., 2017).

On the other hand, our PAF estimates were sensitive to how exposure to bullying was defined in our analyses. Estimates varied as a function of exposure threshold and/or type of bullying, ranging from 18.8% (main exposure threshold) to 5.9% (cyberbullying). However, this variation is likely attributable to how PAF estimates are calculated: as part of the calculation, the proportion of internalising symptom cases among those who are exposed to bullying is subtracted from the proportion of internalising symptom cases among those who are not exposed to bullying. This means that when specific types of bullying are considered (e.g. cyber), those who experience other forms only (e.g. relational and/or physical) are automatically designated as 'unexposed'. While this aids precision in terms of estimating the mental health consequences of different types of bullying, it likely dilutes the PAF estimate. Future research undertaking PAF estimates for different forms of bullying should therefore utilise more sophisticated formulae that can account for multiple, related exposures (Di Maso et al., 2019).

## The Impact of Bullying Exposure on Internalising Symptoms Across Different Groups

With regard to RQ4, bullying exposure had a consistent, uniform effect on internalising mental health caseness across most socio-demographic groups, with two exceptions: LGBTQ+ status and ethnicity. In relation to the former, bullied cisgender heterosexual girls (c.2.5x) and bullied LGBTQ+ youth (c.4x) were significantly more likely to experience borderline/clinical levels of internalising mental health symptoms than bullied cisgender heterosexual boys. These effects were found across bullying exposure thresholds and types. The findings extend the small existing body of previous work by including a measure of sexual orientation in addition to gender identity. Previous studies examining simple gender differences (not accounting for sexual orientation or gender diverse identities) in the effects of bullying on mental health have indicated a stronger effect among females compared to males (Turner et al., 2013; Kim et al., 2019), although one cross-national study found larger effects of physical bullying on mental health among males compared to females (Man et al., 2022).

In parallel, previous research found that lesbian, gay, and bisexual young people who are cyberbullied are more likely to report poor mental health compared to heterosexual cyberbullied young people (Duarte et al., 2018). This was mirrored in our analysis, and may reflect a process that begins with LGBTQ+ youth feeling more confident expressing their identities online, due to the perceived anonymity of the internet, particularly if they do not feel ready to come out to their family and friends. In addition, the online community is a likely support network for these young people (Blumenfeld, 2020). However, as already noted, LGBTQ+ young people are also more likely to fall victim to cyberbullying compared to their heterosexual counterparts. They may be hesitant to seek support when they are victimised, due to a fear of the online support network being taken away if, for example, their parents decided to restrict their social media usage as a result (Blumenfeld, 2020). Further, the fact that online perpetrators can remain anonymous (Vaillancourt et al., 2017) may increase victimisation of the LGBTQ+ community. Finally, as noted above, cyberbullying episodes can be shared widely on the internet (Vaillancourt et al., 2017), which may increase anxiety among LGBTQ+ youth about being 'outed' publicly before they are ready.

Social media platforms such as Facebook and Twitter have 'zero tolerance' policies for harassment and bullying, pledging to remove purposefully harmful targeted content. However, a recent hate crime report indicated that content reported by LGBTQ+ individuals is often rejected by such platforms for not meeting the required criteria, and so posts often remain on the internet (Hubbard, 2020). Although

speculative, these explanations are plausible means by which cyberbullied LGBTQ+ youth are more at risk for poor mental health compared to their cyberbullied cisgender heterosexual counterparts. Future research is needed to gather empirical evidence for these proposed processes so that targeted interventions can be put in place to support this marginalised population (Abreu & Kenny, 2018).

We also found that the impact of bullying exposure on internalising mental health symptom caseness is stronger for White young people compared to Black young people, both for our main exposure threshold and for relational bullying. This indicates that exposure to relational bullying is driving the moderation effect seen between White and Black young people who are exposed to bullying on at least one domain. It is possible that bullied Black young people access certain assets that engender greater resilience to the negative effects of relational bullying. For example, a strong sense of ethnic identity and belonging to one's ethnic group may act as a protective factor against the negative impact of bullying victimisation (Xu et al., 2020). However, further research is needed to establish the veracity of this proposition.

## Implications

The research implications of our findings are clear: how one defines bullying exposure impacts prevalence estimates, and more stringent exposure thresholds may lead to underestimates in the prevalence of bullying. Currently, the evidence base for the prevalence of bullying presents a mixed picture due to inconsistencies in measurement (Vivolo-Kantor et al., 2014). Prevalence estimates differ for different types of bullying exposure and including polyaggression (Modecki et al., 2014) as a metric is likely to dramatically reduce such estimates, leading to an underestimate in the true extent of the scale of the problem. In addition, decisions pertaining to the exposure threshold have implications for the nature and magnitude of both inequalities in bullying exposure and the impact of bullying on internalising mental health symptoms. These findings speak to the importance of clearly defining exactly what is being captured by a bullying measure (Vivolo-Kantor et al., 2014). This also has important implications for evaluating the effectiveness of preventive interventions. Since bullying prevalence estimates vary as a function of how bullying is operationalised in measurement, this is likely to impact the size of intervention effects. For example, larger effects may be observed if bullying is defined as being exposed to at least one form of bullying (compared to polyaggression), as more individuals will be classified as being bullied at baseline.

Turning to the implications for practice, findings from our PAF analyses suggest that in the absence of confounders and assuming causality (Bentivegna & Patalay, 2022),

the eradication of bullying could reduce the prevalence of borderline/clinical internalising symptoms by nearly 20%. Bullying exposure is a modifiable risk factor for internalising mental health symptoms, and school-based bullying interventions are relatively inexpensive. For example, the Learning Together programme, which yields small but significant effects on bullying, has an estimated cost of £47–£58 per pupil over 3 years, which falls into the 'low cost' category for school-based interventions (Bonell et al., 2018; Higgins et al., 2016). Such approaches could therefore be a cost-effective means of reducing clinically significant internalising symptoms cases, especially given the well-established economic burden of mental health difficulties among young people (Knapp et al., 2011). Finally, findings from our inequalities analyses suggest that some groups are more at risk for bullying exposure compared to others, and this should be considered in prevention strategies, as these high-risk groups (such as LGBTQ+ youth) may benefit from targeted support (Abreu & Kenny, 2018).

## Strengths and Limitations

The current study features a number of strengths which help to minimise bias and provide confidence in the robustness of our findings. First, it benefitted from a very large sample of nearly 36,000 adolescents. This naturally facilitated statistical power, particularly when considering inequalities (RQ2) and subgroup moderator effects (RQ4). Furthermore, a key additional benefit is that the composition of this very large sample closely mirrored the GM population of young people from which it was drawn, while also being similar to the national population of 11–16 year olds in England. This gives confidence that our findings are generalisable. Second, our use of within-study sensitivity analyses meant that we were able to complement existing meta-analytic evidence (e.g. Modecki et al., 2014) because we could account for confounds beyond the measurement approach used, such as sampling strategy. Third, in line with open science recommendations (Kathawalla et al., 2021), analyses were pre-registered prior to being undertaken, adding an additional layer of transparency. Fourth, multiple imputation was used across these analyses in order to minimise bias associated with missingness.

However, there are also a series of limitations that should be borne in mind when considering the implications of the current study. First, the underpinning dataset was cross-sectional, limiting causal inference (though we note the different time frames of our bullying and internalising symptoms measures, with the former asking respondents to consider the last six months, and the latter asking them to consider their current state). An important next step, therefore, is to assess the extent to which our findings can be replicated longitudinally. This is particularly important given the evidence

for a potential *bi-directional* relationship between bullying victimisation and internalising symptoms (i.e. victimisation increases the likelihood of experiencing later internalising symptoms, but said symptoms also increase vulnerability to later victimisation; Christina et al., 2021). Second, we highlight the particular features of the measures used in the current study, which as demonstrated in the introductory section of the paper, likely influenced our substantive findings. Thus, both our exposure and outcome measures were both based on self-reported data. While this is arguably the optimal approach for both bullying victimisation and internalising symptoms, it means that common method variance and/or same source bias may both have contributed to the magnitude of the associations reported. Furthermore, although our bullying items were derived from well-established cohort studies, their wording does not explicitly note the power imbalance that is so fundamental to bullying (though this is, however, clearly implied). Additionally, all three items used give examples of targeted behaviours (such as being called names in the relational bullying item) and also explicitly reference bullying, both of which lead to significantly lower prevalence rates than those that do not (Modecki et al., 2014).

Third, while varying the exposure threshold to consider victimisation in more than one domain of bullying enabled us to enhance understanding of the prevalence, inequalities, and impact of polyaggression, this was at the expense of other possible sensitivity analyses, including relative *frequency* of victimisation exposure (see, for example, Moore et al., 2017). Finally, caution should be applied in the interpretation of odds ratios such as those presented here, given that the prevalence of internalising symptoms cases, at approximately 27%, is not considered 'rare' in epidemiological terms (Wilber & Fu, 2010).

## Conclusion

Leveraging secondary analyses of a unique contemporary dataset, the current study has rigorously demonstrated that measurement matters when considering the prevalence, inequalities, and impact of bullying. More specifically, varying the exposure threshold and specific type of bullying impacts our estimates of how many are bullied (e.g. as low as 5% to as high as 16%), who is more or less likely to be bullied (e.g. cisgender heterosexual girls are significantly more likely to be bullied on at least one domain than cisgender heterosexual boys, but no more or less likely to be victims of polyaggression; cisgender heterosexual girls are significantly *more* likely than cisgender heterosexual boys to experience relational or cyberbullying, but significantly *less* likely to experience physical bullying), and how

exposure to bullying impacts mental health difficulties (e.g. higher OR of internalising symptoms caseness among victims of polyaggression). Our analyses illustrate the complexity and nuance of the role played by bullying exposure in adolescence and suggest that caution is required when applying such research findings to inform identification and prevention efforts.

## Declarations

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