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ABSTRACT

COVID-19, School Closures and (Cyber) Bullying in Germany*

We analyze the prevalence of bullying in Germany during COVID-19, both as a real-life phenomenon (in-person bullying, or in our context: school bullying) and via social media and electronic communication tools (cyberbullying). Using Google Trends data from 2013 to 2022 and exploiting the COVID-19 pandemic as a natural experiment when schools switched to distance learning, we document stark changes in the prevalence of (cyber) bullying in Germany: Our results indicate that during school years affected by COVID-19, online searches for school bullying decreased by about 25 percent, while online searches for cyberbullying increased by about 48 percent during the same periods.

JEL Classification: H75, I12, I21, I28, I31
Keywords: school bullying, cyberbullying, Google Trends

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1 Introduction

Bullying is not merely a contemporary phenomenon; rather, it is deeply entrenched in our society's historical fabric. This fact is vividly illustrated by the timeless novel "Oliver Twist" from the early 19th century (Dickens, 1992). Present-day popular culture offers numerous references that prominently engage with the topic of bullying, including the iconic film "Karate Kid" (Avildsen, 1984), the renowned song "Mean" by Taylor Swift (2010), and the widely watched Netflix series "13 Reasons Why" (which is in turn based on the novel "Thirteen Reasons Why" by Asher, 2007).

However, the forms and management of bullying have undergone significant transformations over time. Defined by Olweus (2008) as "intentional, repeated negative (unpleasant or hurtful) behavior exhibited by one or more individuals towards a person lacking the means to defend themselves," contemporary instances of bullying no longer confine themselves solely to physical encounters. Instead, there is an escalating prevalence of cyberbullying—an offshoot of bullying that leverages electronic communication tools and social media platforms for victimization. Furthermore, society's approach to bullying has evolved. No longer is it relegated to a peripheral concern; rather, it is recognized as a comprehensive societal challenge that demands serious attention.

This is also because bullying is associated with significant costs, with the educational realm standing as a focal point of research. This distinct research focus on school-related bullying stems primarily from the fact that adolescents dedicate a substantial portion of their childhood and youth to school, a pivotal stage in their development. The adverse outcomes of bullying include short-term effects on the direct victims, yielding manifestations in psychosomatic ailments like "headache, stomach ache, backache, dizziness" (Due et al., 2005), as well as giving rise to conditions such as eating disorders (Lie et al., 2021) and precipitating depression and thoughts of suicide (Perren et al., 2010; Alavi et al., 2017). Moreover, compelling evidence suggests that the social milieu surrounding direct victims of bullying is likewise influenced by resulting complications in interpersonal relationships and social adaptation (Álvarez Marín et al., 2022). Lastly, bullying can hinder positive development during childhood and adolescence, thus en-

gendering enduring repercussions. Numerous individuals persist in grappling with the aftermath of bullying well into adulthood (Wachs et al., 2016) and may confront "significant long-term individual psychological and somatic consequences" (Jäger et al., 2007). Prolonged health detriments, akin to post-traumatic stress disorder, are possible (Idsoe et al., 2012).

Our paper addresses the issue of bullying within the school environment. To be more precise, we investigate the influence of the shift to remote learning caused by the sudden closure of schools amid the COVID-19 pandemic on the occurrence of school bullying and cyberbullying in Germany. The transition to the virtual realm for daily school activities could naturally lead to the expectation that interactions would follow suit, potentially exposing children and adolescents to a higher frequency of cyberbullying compared to before. Conversely, due to diminished opportunities for face-to-face engagement, conventional school bullying might manifest less frequently. Indications that such changes in the prevalence of school bullying and cyberbullying could occur were already evident before the onset of the COVID-19 pandemic: Increased internet usage is associated with increased reports of cyberbullying among children and adolescents (Kowalski et al., 2014, 2019). Additionally, during the early stages of the pandemic, German parents reported that their children encountered less bullying while schools were closed (Werner and Woessmann, 2023).

To analyze changes in the prevalence of bullying and cyberbullying in Germany during COVID-19, we use online search data from Google Trends. These publicly available data offer the advantage of providing comparable time series of search intensity for various keywords at a high frequency (we use monthly data). Nowadays, Google Trends is an established data source that is widely used for research purposes, particularly for "real-time" predictions of social and economic outcome variables (Stundziene et al., 2023). For instance, these data have been employed to forecast unemployment trends (Askitas and Zimmermann, 2009), election results (Stephens-Davidowitz, 2014), disease outbreaks (Carneiro and Mylonakis, 2009), the spread of COVID-19 (Caperna et al., 2022), and fertility decisions (Kearney and Levine, 2015), among others.

Most closely related to our study is Bacher-Hicks et al. (2022). These authors also analyze online search data from Google Trends to assess the impacts of pandemic-induced school closures on school bullying and cyberbullying—albeit with a regional focus on the United States. Their results show a simultaneous decrease in online searches for school bullying and cyberbullying, amounting to roughly 30 to 35 percent during periods of remote learning. Moreover, following the cessation of school closures, a resurgence in online searches for both forms of bullying returns to levels akin to those prior to the pandemic. The authors draw two main conclusions from their findings: First, personal interactions could be prerequisites for both forms of bullying. Second, school closures and the shift to remote learning likely had a positive impact on students' mental health due to reduced bullying. The latter effect mitigates other adverse impacts of the pandemic on the mental well-being of adolescents—and may even exceed these effects. For instance, Hansen et al. (2022) find that returning from online to in-person schooling was associated with a 12 percent to 18 percent rise in teenage suicides in the United States. Prior to this, according to their findings, teenage suicide rates had significantly decreased during pandemic-induced periods of school closures and remote learning in the United States.

However, there are also opposite findings on mental health during the pandemic for the United States. For example, Hawrilenko et al. (2021) find that school closures were associated with increased mental health problems when the authors analyze nationally-representative survey data from parents. Similar results emerge for childcare disruptions. Gassman-Pines et al. (2022) find a positive association between these disruptions and remote schooling, and negative impacts on child behavior and parental mood.

More generally, results on the prevalence of school bullying and cyberbullying during the pandemic paint a mixed picture. While the results of an extensive survey conducted in Finland also corroborate a significant decline in the occurrence of bullying amidst the pandemic (Repo et al., 2024), studies based on surveys, official reports, or analyses of social media from the United States, Canada, and Australia point to a notable surge in cyberbullying during the COVID-19 period (Patchin and Hinduja, 2023; Inman Grant,

2021; Karmakar and Das, 2021). In Canada, there are even results supporting a higher prevalence of all forms of bullying during the pandemic (Vaillancourt et al., 2021).

Our findings for Germany contrast with the results of Bacher-Hicks et al. (2022), even though we also employ online search data from Google Trends and define bullying analogously. On the one hand, we observe a decline in online searches related to school bullying of a comparable magnitude, approximately 25 percent, during the years affected by pandemic-induced school closures. However, our analyses reveal a notable increase of around 48 percent in online searches for cyberbullying during the same period. Thus, our results support the expectation that reduced in-person interaction at schools contributes to a decrease in school bullying, while increased use of online technology leads to an uptick in cyberbullying. Moreover, the fact that the prevalence of cyberbullying, according to our findings, has continued to grow even beyond the pandemic's duration, while the prevalence of traditional bullying remained stagnant at pandemic levels, further suggests that cyberbullying among students in Germany has solidified its presence sustainably.

Thus, a pandemic-induced decrease in both forms of bullying, as observed in the U.S. context, and the derived conclusion from the companion U.S. study that cyberbullying "rarely occurs independently of in-person bullying" (Bacher-Hicks et al., 2022) cannot be confirmed for the German context. Potential explanations for the different findings could encompass variations in schools' digitalization progress prior to the pandemic (see, e.g., Ikeda, 2020) as well as different digital literacy levels among students and teachers. More specifically, increasing cyberbullying in Germany might have been influenced by the fact that especially younger and less experienced students in terms of online social media may have gained access to these platforms for the first time without receiving adequate guidance and supervision over their online activities.

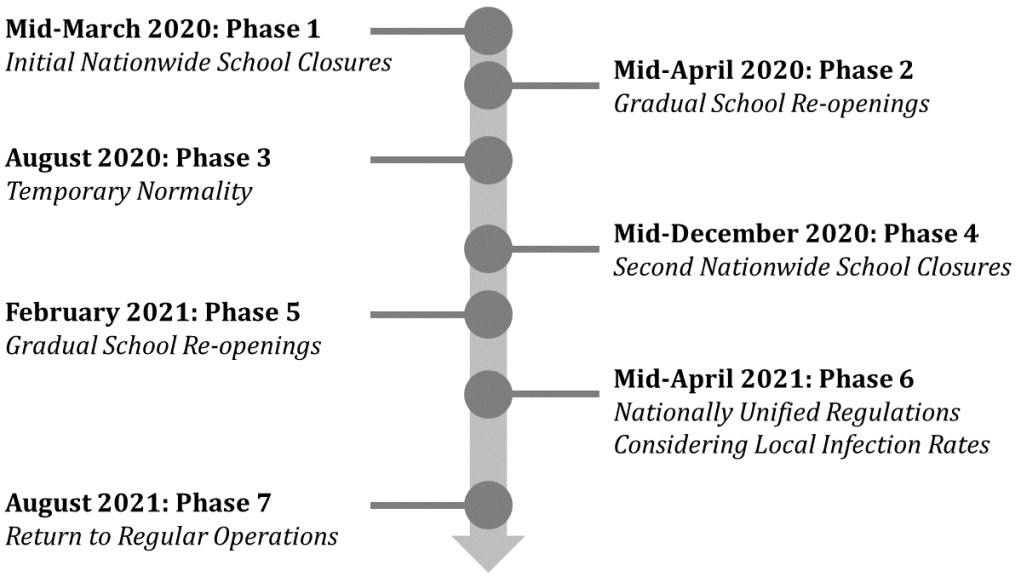
Ultimately, our finding of a sustained increase in the prevalence of cyberbullying in Germany underscores a need for policy intervention. This conclusion arises from research indicating that cyberbullying is linked even more closely to suicidal ideation than victimization by peers within the physical environment (van Geel et al., 2014).

2 COVID-19 and the German School System

In response to the outbreak of COVID-19 and its classification as a pandemic by the WHO on March 11, 2020, various measures to slow down the spread of the novel coronavirus were implemented in Germany, affecting nearly all aspects of life. The school system was no exception.

Due to the heterogeneity of the regional spread of COVID-19, the strong federal structure of the German education system, and conflicts between federal and state governments in the field of infection control, there was no uniform or nationwide approach to education policy. However, while there were minor regional variations in the timing of school closures and re-openings (attributed, for example, also to different summer breaks and holiday seasons in different federal states; Isphording et al., 2021), the pandemic's impact on schools can be chronologically divided into a total of seven phases, which are described below. Additionally, Figure 1 provides an overview of the chronological sequence of measures in these seven phases.

Figure 1: Germany's Responses to COVID-19 in Education Policy (Overview).



Phase 1 (Mid-March 2020 to Mid-April 2020): Initial Nationwide School Closures On March 13, 2020, most federal states announced the closure of their schools. The remaining federal states followed shortly thereafter, resulting in the suspension of in-person school attendance across Germany from March 18, 2020. However, the general obligation to attend school remained intact, and the majority of students in Germany continued their education through remote learning. Consequently, during the first lockdown, tasks assigned by teachers had to be completed by students at home.

Phase 2 (Mid-April 2020 to the End of the 2019/20 School Year): Gradual School Re-openings Starting from April 20, 2020, the federal states began to reintroduce in-person teaching in a non-uniform manner, based on the type of school and grade level. This transition involved shifting from solely remote learning to blended learning, which alternated between in-person and remote teaching. The return to schools occurred gradually and was accompanied by protective and hygiene measures, such as social distancing, mask mandates, mandatory handwashing, sanitizing, and classroom ventilation. In-person schooling was resumed for smaller groups of students, on a reduced scale, and prioritized for specific school grades (e.g., graduating classes).

Phase 3 (August 2020 to Mid-December 2020): Temporary Normality Decreasing infection rates prompted the federal states to implement extensive relaxations in school policies. Starting in early August 2020, the summer breakes ended gradually in different federal states. With the beginning of the 2020/2021 school year, students of all grade levels across Germany were able to return to full-capacity, in-person classes while adhering to hygiene protocols (and depending on regional infection rates). Schools remained open even as the pandemic situation intensified in the fall (leading to a "light lockdown" on November 2, 2020, in response to rising infection rates).

Phase 4 (Mid-December 2020 to End of February 2021): Second Nationwide School Closures As attempts to contain the spread of the virus were insufficient, a second strict lockdown was enforced on December 16, 2020, resulting in nationwide school

closures again. The federal states ensured a gradual transition into the Christmas break by introducing days without classes and allowing students to choose between in-person and distance learning. Schools remained closed beyond the Christmas break. By February 22, 2021, distance learning, which had become legally equivalent to in-person instruction, was mandatory for all students in Germany.

Phase 5 (End of February 2021 to Mid-April 2021): Gradual School Re-openings The re-opening of schools occurred in two phases. Similar to after the first lockdown, specific grade levels of students, now including those in elementary schools, transitioned from distance to in-person learning first. The second phase, which saw all remaining students being taught in a hybrid mode, started shortly before the Easter break. School re-openings were accompanied by a testing strategy involving voluntary weekly COVID-19 testing and a vaccination campaign for school staff starting in March 2021.

Phase 6 (Mid-April 2021 to End of the 2020/21 School Year): Nationally Unified Regulations Considering Local Infection Rates A new wave of infections starting from late March 2021 led the federal government to replace state-specific measures with a law featuring nationally unified regulations. On April 23, 2021, the *Bundesnotbremse* (Federal Emergency Brake) was implemented. This imposed strict guidelines linked to infection rates for the education system. In-person instruction was tied to mandatory COVID-19 testing for teachers and students, with increased testing frequency required at specific infection thresholds. Beyond this threshold, hybrid learning became mandatory, and at a higher threshold, distance learning was enforced. Special arrangements were only granted to graduating classes and special education schools.

Phase 7 (from August 2021): Return to Regular Operations The start of the 2021/22 school year marked the return to regular school operations. Full curriculum and class schedules resumed, and extracurricular activities such as excursions, field trips, and student exchanges were once again allowed.

3 Data

3.1 Background and Validation

We use online search data from Google Trends to analyze changes in the prevalence of bullying and cyberbullying in Germany during COVID-19. Google Trends is a free, publicly accessible online service provided by the U.S.-based company Google LLC. Since its introduction in 2006, it has established itself as a data source for a wide range of applications, particularly in the context of "nowcasting" (Stundziene et al., 2023). It is used in research, among other things, to explore consumption trends (Silva et al., 2019), detect disease outbreaks (Ginsberg et al., 2009), predict the spread of COVID-19 (Caperna et al., 2022), or forecast fertility decisions (Kearney and Levine, 2015).

Online search data from Google Trends offer several advantages over conventional survey data: they are freely available and easily accessible, and they are provided in high frequency, as consistent time series, and nearly in real-time. A large amount of data is available with minimal effort required for data acquisition. Retrospective investigations are possible without relying on the memory of survey participants. Furthermore, the influence of social desirability, potential downplaying, masking and deception strategies, as well as suppression effects on response behavior, is minimized. This is especially important for sensitive topics such as drug use, racism, partner violence, sexual harassment, or—as in our case—bullying.

However, online search data from Google Trends are not necessarily representative for the entire population—even though Google is the most visited website in the world (with about three billion search queries per day and a market share of over 92 percent; StatCounter, 2023). In our context—bullying in the school environment—younger students, for example, might not yet use the internet. Additionally, the data do not contain any information about individuals and their socio-demographic characteristics. Thus, potential correlations between experiences of bullying and characteristics such as gender, migration background, school type, socioeconomic status, and mental well-being cannot be investigated. In the context of school bullying, it is also not possible to distin-

guish between students and teachers as potential victims. The lack of information about the intention behind the Google search queries is a limitation, too: an online search for "bullying" can, therefore, indicate an objective interest, a plea for help from a bullying victim, experiences of witnesses, or the intentions of perpetrators. Finally, research findings based on online search data from Google Trends are not precisely replicable. This is because Google Trends provides their data based on samples—the representativeness of which for the overall data is, however, assured by Google.

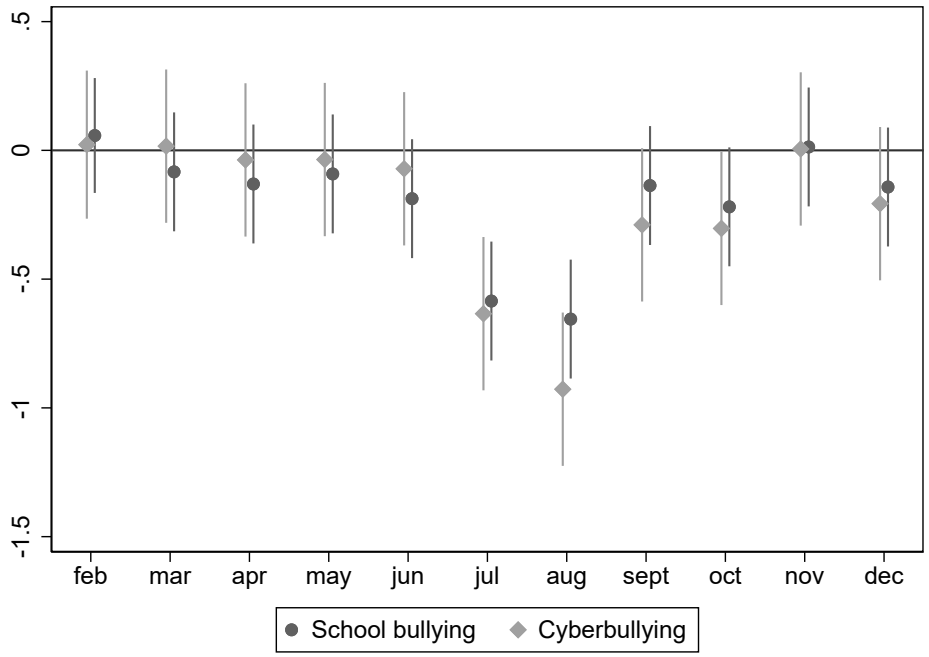
Given these limitations, we argue nonetheless that the advantages of using online search data from Google Trends for our analysis clearly outweigh any drawbacks. In supplementary analyses, we have used survey data (Schneider et al. 2013; Beitzinger and Schneider 2017) to assess the validity of the online search data from Google Trends for our research questions. Our corresponding results confirm (part of) the findings of Bacher-Hicks et al. (2022) for Germany: they suggest that the relevant online searches are indeed related to actual bullying behaviors among students in Germany, and that they can therefore be used as proxies of the prevalence of school bullying and cyberbullying in Germany. We find, for example, strong seasonal patterns in the data—in line with (regional) summer breaks, see Figure 2—as well as strong correlations between self-reported regional bullying rates from surveys and the regional intensity of online searches for bullying-related topics.[1]

3.2 Search Topics and Descriptive Overview

Through Google Trends, it is possible to access time series data on the popularity of Google search queries for user-defined topics and terms. A topic is defined as a group of search terms related to the same concept or entity in any language. In our study, the Google search queries for "school bullying" (in German: "*Mobbing in der Schule*") and "cyberbullying" (in German: "*Cyber-Mobbing*") are used. Since Google Trends responds to low search volumes with a zero output, a topic search is conducted for both terms. This approach also has the advantage of considering various spellings, declensions, and

[1]The latter results are available upon request.

Figure 2: (Pre-pandemic) Seasonality in Google Trends data.

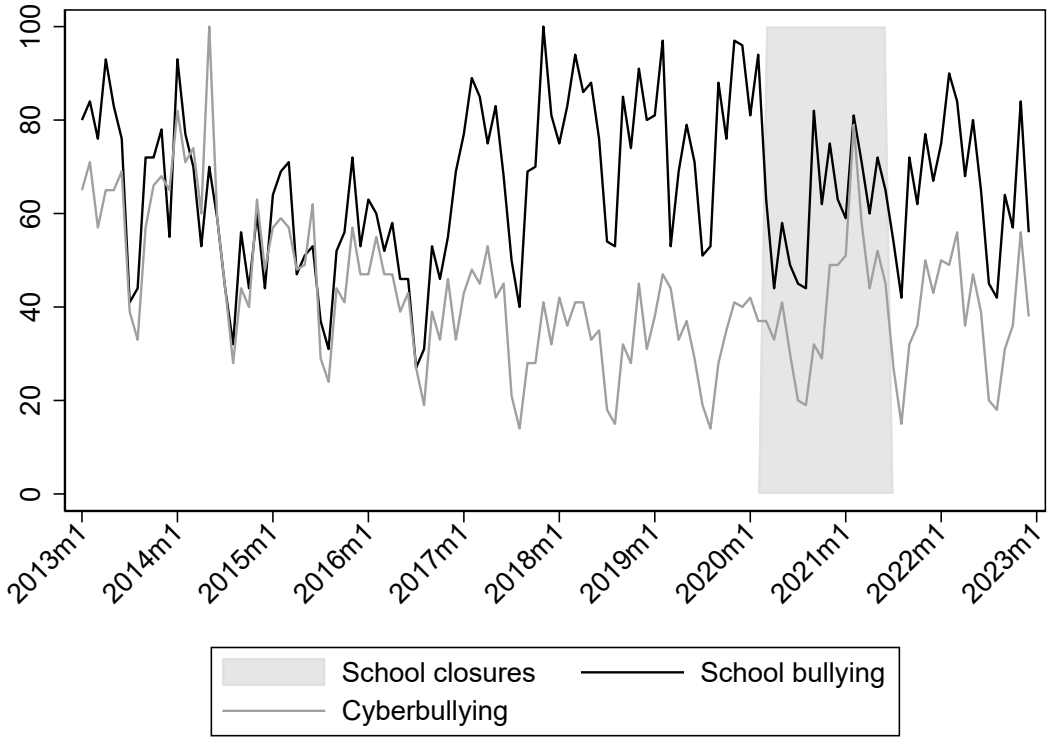


Notes: Parameter estimates from a model of Google Trend logs regressed on on calendar month fixed effects. $N = 86$.

Google search queries with typographical errors.

Figure 3 illustrates our monthly raw data on topic searches for "school bullying" and "cyberbullying" from January 2013 to December 2022. The measure of online searches provided by Google Trends is search intensity (in monthly frequency as we analyze a time period of more than five years; Timoneda and Wibbels, 2022). It should be noted that these numbers do not represent absolute values but rather normalized relative values. The calculation of search intensity involves comparing the number of Google search queries dedicated to a specific term or topic for each data point to the total volume of Google search queries in the corresponding area and time interval. This determines the relative demand. Subsequently, the quotients are normalized relative to the maximum value, and the search intensities are reported on a scale of 0 to 100. Normalizing search data based on time and location allows for comparisons, for example, between densely and sparsely populated regions. Additionally, comparative searches can be conducted through Google Trends, considering up to five different topics or search terms. Thus, values of search intensity can be compared over time and between terms or topics.

Figure 3: Online Searches for “school bullying” and “cyberbullying” in Germany.



As Google Trends does not disclose the raw search volume, the absolute number of search queries remains unknown. On one hand, this poses the risk of overestimating or underestimating the extent of a trend. On the other hand, it remains unclear to what extent changes in search intensity are based on changes in the numerator or denominator, that is, the number of specific searches or the total number of Google searches. In cases of ambiguity or unclear definitions of the search term, biased results are also likely. Furthermore, Google Trends does not provide information on which search terms are included in the topic search (Bacher-Hicks et al., 2022). Regarding our topic search, for example, it remains unclear to what extent the data also include online searches for specific bullying actions, such as insults or physical violence.

4 Empirical Specification

In general, an empirical model of Google Trends data, or any other time series data, should account for seasonality and trends in our context. Regarding seasonality, Figure 2 implies the presence of seasonal patterns in online searches for both school bullying and cyberbullying, indicating a lower prevalence of both forms of bullying behavior during school holidays. Moreover, Figure 3 shows that the amplitudes of the repeating short-term cycles in the time series are almost constant, suggesting linear seasonality.

Next, the 12-month moving averages presented in Figure 4 speak in favor of a constant downward trend for cyberbullying before the pandemic. A Supremum Wald test for a structural break confirms this observation (*p*-value = 0.170). For school bullying, a downward trend at the beginning of our observation period appears to switch into an upward trend around 2016, which is subsequently followed by a plateau. Indeed, a formal test for trend changes, as proposed by Maeng and Fryzlewicz (2023), identifies two structural breaks in our sample from January 2013 to December 2022 ($t = 1, 2, 3, ..., 120$) in June 2016 ($t_1 = 41$) and in March 2017 ($t_2 = 50$).[2]

In line with these considerations, we estimate the following additive model of the (log-transformed) Google Trends data for cyberbullying:

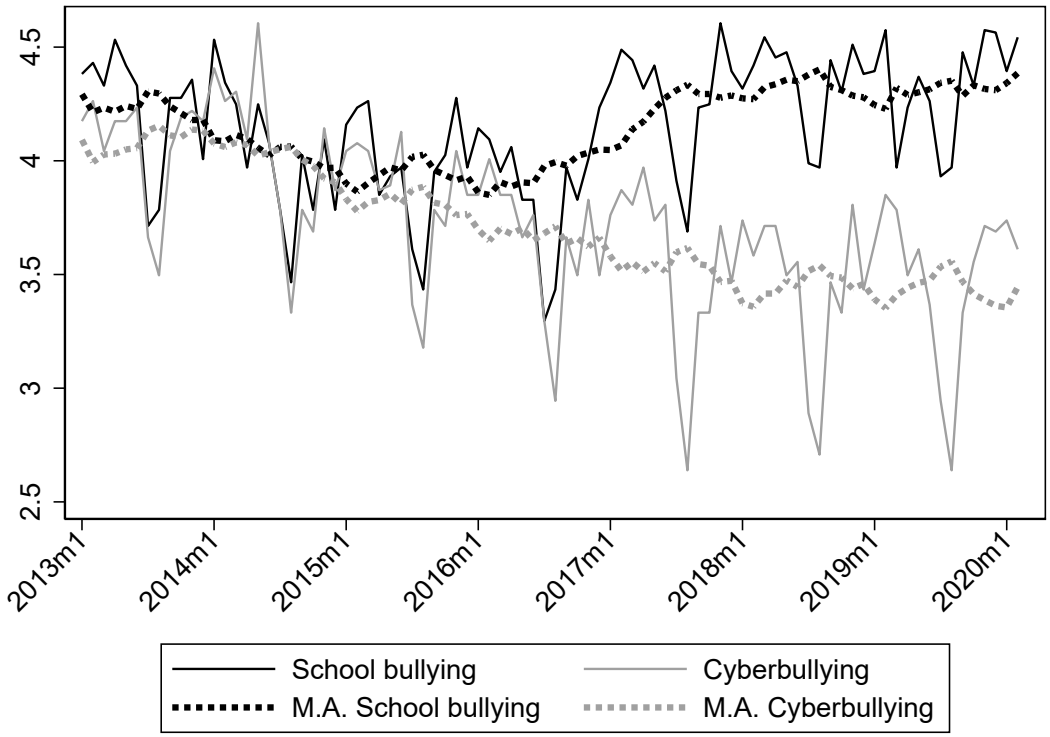
$$log(y_t) = \alpha + \tau_{COVID} COVID + \tau_{POST} POST + \gamma t + \delta' \mathbf{M} + \epsilon_t \ , \tag{1}$$

where $POST = \mathbb{1}[t > t_{POST} = 87]$ is an indicator variable for the post-COVID-19 period starting in August 2021 ($t > t_{POST} = 104$), $COVID = \mathbb{1}[t \in (t_{PRE}, t_{POST})]$ is an indicator variable for the COVID-19 period that started in March 2020 ($t > t_{PRE} = 86$), t is a linear time trend, and $\mathbf{M}$ is a vector of monthly dummy variables (calendar months).

For school bullying, we add two variables to this model which account for the structural breaks identified at $t_1 = 41$ and $t_2 = 50$: $q_{break1} = t - 41$ for $t > t_1$ ($q_{break1} = 0$ if otherwise) and $q_{break2} = t - 50$ for $t > t_2$ ($q_{break2} = 0$ if otherwise).

[2] A Wald test for structural breaks with known break dates rejects the null of no structural breaks at $t_1 = 41$ and $t_2 = 50$ ($\chi^2 = 47.097$, *p*-value = 0.000).

Figure 4: Pre-treatment Trends (in logs) of Google Trends Online Searches for "school bullying" and "cyberbullying", including Moving Averages.



5 Empirical Results

Table 1 shows our estimates of τ_{COVID} and τ_{POST} for online searches referring to school bullying and cyberbullying, respectively. Compared to the pre-pandemic period, school closures during the COVID-19 pandemic are associated with a decrease in online searches for school bullying by approximately 28.7 percent but with an increase in online searches for cyberbullying by 39.5 percent. Furthermore, while online searches for school bullying remain at a similar, i.e., lower level after school re-openings[3], online searches for cyberbullying continue to increase even after schools were re-opened. Compared to the period of school closures, the additional increase in online searches for cyberbullying amounts to 13.2 percentage points.

Figure 5 illustrates our findings by contrasting actual values of online searches in Google Trends data with predicted values based on a variant of model (1) for the pre-

[3]Note that a Chow test indicates the equality of τ_{COVID} and τ_{POST} for school bullying (p-value of 0.757).

pandemic period with calendar month fixed effects and trends only. It shows that the predictions overestimate online searches for school bullying but underestimate online searches for cyberbullying to an even larger extent.

To gain further insights into the underlying dynamics, Figure 6 plots the residuals for the period of school closures and beyond. This illustration suggests that it took some time for cyberbullying to reach its peak. A possible explanation is that the mental stress associated with social isolation accumulates first before it turns into aggression (e.g., Killgore et al., 2021). Additionally, students may have needed time to adapt to an environment with more intense and less regulated access to the online world during distance learning.

	School bullying	**Cyberbullying**
COVID	-0.287***	0.395***
	(0.070)	(0.069)
POST	-0.274***	0.527**
	(0.081)	(0.055)
Month dummies	Yes	Yes
Trend	Yes	Yes
Trend break 1	Yes	No
Trend break 2	Yes	No
N	120	120
R^2	0.811	0.851

- Google Trends data from January 2013 to December 2022.
- Dependent variable: (log-transformed) online searches.
- Robust standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01.

Table 1: The Effects of COVID-19-related School Closures on Online Searches for "school bullying" and "cyberbullying" in Germany.

6 Conclusions

Our analysis of Google Trends data shows a significant decrease in online searches for school bullying and a very significant surge in online searches for cyberbullying during the school years affected by the pandemic (and school closures). Notably, the decrease in online searches for school bullying, amounting to approximately 25 percent, persists even after the re-opening of schools. Conversely, we observe a sustained surge in online searches for cyberbullying even after school re-openings: Throughout the pandemic-affected school years, online searches for cyberbullying increased by roughly 40 percent, escalating to more than 50 percent afterward (in both cases, compared to the pre-pandemic baseline).

Our results thus confirm the expectation that reduced face-to-face interaction in schools contributes to a decline in in-person bullying (school bullying), and that the increased use of online technology leads to an increase in cyberbullying. The noteworthy point is that the prevalence of cyberbullying continues to rise even after the end of pandemic-induced school closures, while the prevalence of school bullying remains essentially at the same level observed during the pandemic. This implies that bullying through electronic communication has not only become more prevalent but has also established itself sustainably.

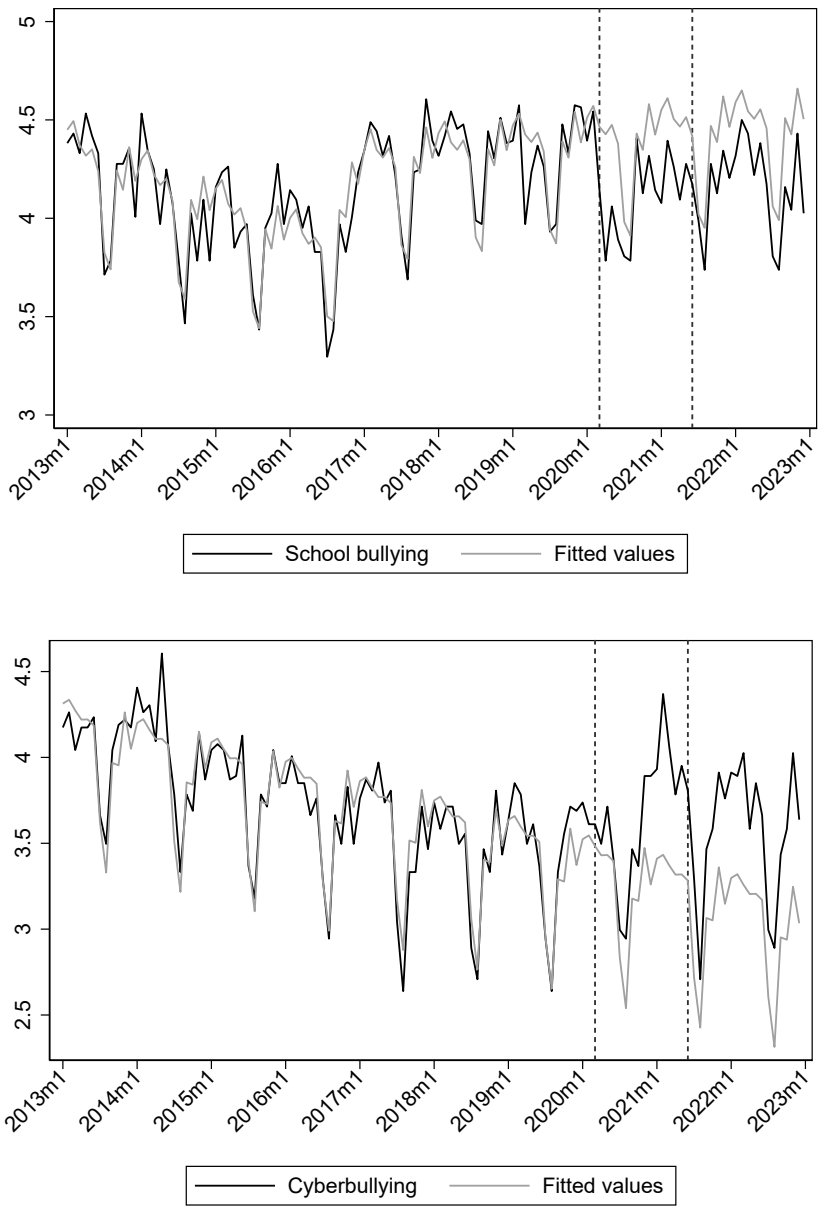
Therefore, a pandemic-related decline in both forms of bullying among students in the United States and the conclusions drawn in Bacher-Hicks et al. (2022) that cyberbullying "rarely occurs independently of in-person bullying" cannot be confirmed for the German context. Possible explanations for these divergent findings may stem from variations in pre-pandemic levels of digitalization in schools (see, e.g., Ikeda, 2020) and disparities in media literacy among students and teachers.

From a policy perspective, it is conceivable that the surge in cyberbullying prevalence in Germany may be attributed to younger, less experienced students gaining extensive access to new media without adequate supervision of their online activities. Moreover, the efforts to combat bullying have only partially transitioned to the virtual realm. Consequently, both aspects should be focal points for policy interventions.

However, it is crucial not to infer from our findings that cyberbullying is a mere reflection or extension of in-person bullying into the virtual space. Despite our results indicating a decline in school bullying and a concurrent rise in cyberbullying, there exist distinct conceptual disparities between in-person bullying and cyberbullying. Factors such as the potential for cyberbullying perpetrators to maintain anonymity, the absence of direct feedback from victims, and the diminishing importance of physical dominance, which often plays a role in in-person bullying, could contribute to a shift in the dynamics between perpetrators and victims in the online realm.

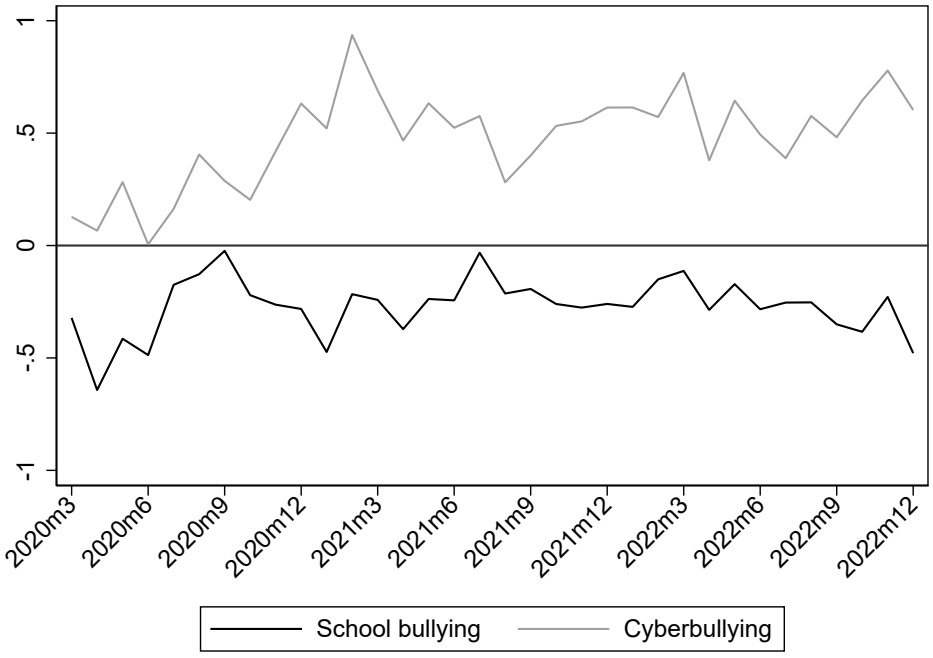
From a broader perspective, our findings contribute one facet to the diverse impacts that school closures incurred during the pandemic. However, we concur with Jack and Oster (2023), who argue that a comprehensive understanding of the long-term effects of COVID-related school closures on students will require an extended period of observation—and the analysis of a very broad range of outcomes.

Figure 5: Actual and Predicted Google Trends Online Searches (in logs).



Notes: Predictions are based on the fitted models presented in Section 4 for the pre-treatment period.

Figure 6: Residuals from a Model of (log-transformed) Google Trends Online Searches, Regressed on Calendar Month Fixed Effects and Pre-pandemic Trends.



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