SHORT REPORT

Child maltreatment during COVID-19: Deviations from forecasted projections of criminal filings in Oklahoma in 2020

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KEYWORDS: child abuse, COVID-19, neglect, Oklahoma, pandemic

Key Practitioner Messages
• Oklahoma saw a significant drop in the number of criminal filings of child abuse and neglect during the pandemic.
• Deviations from forecasted filings were largest in magnitude (~92%) in August and September 2020, when most children were unable to return to school due to closures.
• Disrupted surveillance and isolations likely contributed to reduction of filings, which could be deterred by increased funding for child welfare organisations and prioritising vaccinations for teachers during pandemics.

INTRODUCTION

The state of Oklahoma ranks among the nation’s highest in child abuse and neglect prevalence, with 15.9 confirmed cases per 1000 children (Oklahoma State Department of Health, 2018). Moreover, Oklahoma has consistently ranked low in overall child wellbeing compared to other states (Annie E. Casey Foundation, 2020). Oklahoma’s poor child wellbeing status is attributable to many factors including high prevalence of poverty, housing instability, food insecurity, lack of health care coverage, and low parent educational attainment – all of which are risk factors for child maltreatment (Annie E. Casey Foundation, 2020; Hunter & Flores, 2021).

Previously, we found that criminal filings of child abuse and neglect significantly decreased in the state of Oklahoma during the first six months of 2020 during the SARS-CoV-2 (COVID-19) pandemic (Whelan et al., 2020). The first case of COVID-19 was identified in Oklahoma on March 6, 2020, prompting a state-wide Safer-at-Home order on March 24, 2020 (Oklahoma Executive Order: Safer at Home, 2020). Following these Safer-at-Home orders, many families faced increasing stress and risk of parental substance misuse due to financial hardships from lost wages, thus adding to the risk for abuse (Bradbury-Jones & Isham, 2020; Flory et al., 2009; Liu & Doan, 2020). Our initial findings showed that criminal filings were significantly lower than a projected model based on 10 years of previous data, culminating in a 63 per cent difference in actual filings compared to forecasted filings in June of 2020 (Whelan et al., 2020). Beyond the Safer-at-Home order, Oklahoma courts reopened with few interruptions (Oklahoma State Courts Network, 2021) and crime rates remained consistent with pre-pandemic levels (Carter, 2020). As the pandemic continued to take its toll, the state did little in the way of policy change aimed at alleviating these burdens (Polansky, 2020). Additionally, most schools did not return to in-person learning in the fall semester of 2020, likely limiting child abuse and neglect surveillance by teachers and school staff. Thus, we hypothesised that the rates of child abuse filings continued to decline during the summer and autumn months of 2020.
METHODS

Data collected from Oklahoma State Court Network (OSCN) was provided by a third party with identifiable information removed. Further, duplicative entries and filings attributed to the same individual pertaining to the same case number and crime were removed prior to the dataset being provided to us, thus eliminating duplicate counts. Using this data, we compiled monthly counts of criminal cases of physical and sexual child abuse, neglect, domestic violence in the presence of minors, failure to protect a child, and solicitation of a minor, from January 2010 through December 2020. To measure deviations in filings, we used auto-regressive integrative moving average (ARIMA) models (Hyndman & Khandakar, 2008) to forecast the projected criminal filings from February 2020 through December 2020 and assessed differences between the predictions and the actual values. ARIMA modelling has been used to inform and direct policy in the economic (Dhahri & Chabchoub, 2007) and energy sectors (Erdogdu, 2007), as well as in the field of controlled substance laws and prevention (Cunningham & Liu, 2008; Troelstra et al., 2016; Wyatt et al., 2013). Corrected Akaike tests (AICc) were used to determine the best model and Ljung–Box test results were reported. Next, we used an integral function to calculate the area between the actual and forecasted curves to approximate the number of criminal filings which may have gone unreported during these months. All analyses were conducted in R. This study followed STROBE reporting guidelines, and an institutional review board determined this study did not constitute human subjects research.

RESULTS

Total criminal filings of child abuse were lower than projected models for February and April through November, before returning to normal expected values in December (Figure 1). Statistically significant decreases began in May with 80 filings compared to an expected 109.2 (95%CI: 80.6–137.7), which continued to decline through September, during which only eight filings occurred compared to the projected 102.0 (95%CI: 71.3, 132.7) – 92.2 per cent fewer than expected (Table 1). All types of criminal filings were lowest during August and September. From the integral calculation, the cumulative difference between forecasted values and actual filings from February through November was 457.3 (442.2–472.4). Findings for crimes were within predicted confidence intervals in November, while filings of neglect were significantly higher than predicted in December. The parameters for the ARIMA model for p, d and q were 0, 1 and 1, respectively, with seasonality parameters P, D and Q set to 1, 0 and 1. The model fit AICc was 976.95, and Ljung–Box Q was 35.28 (df = 21, P = 0.03).

DISCUSSION

Our findings suggest that Oklahoma criminal filings for child abuse and neglect continued to decline for most of the latter half of 2020 before rising to expected levels near the end of the year. Child abuse and neglect in Oklahoma likely

![Figure 1](https://via.placeholder.com/150)

**Figure 1** Total and predicted criminal cases of child abuse (physical and sexual), neglect, domestic violence in the presence of a minor, failure to prevent injury or neglect, and solicitation of minors.
TABLE 1  Forecasted and actual criminal filings of child abuse and neglect in the last six months of 2020 during COVID-19 pandemic in the state of Oklahoma, USA

| Month | Total | Neglect | Domestic violence in presence of minor | Physical abuse | Sexual abuse |
|-------|-------|---------|----------------------------------------|----------------|--------------|
|       | Forecasted (95%CI) | Actual | Forecasted (95%CI) | Actual | Forecasted (95%CI) | Actual | Forecasted (95%CI) | Actual | Forecasted (95%CI) | Actual |
| 07/2020 | 111.5 (81.9, 141.2) | 25 | 16.8 (2.9, 30.7) | 5 | 46.2 (28.6, 63.7) | 12 | 18.6 (12.0, 25.1) | 2 | 19.3 (9.6, 29.0) | 6 |
| 08/2020 | 104.9 (74.7, 135.1) | 16 | 15.1 (0.8, 29.5) | 0 | 42.8 (25.2, 60.4) | 7 | 14.3 (7.6, 20.9) | 3 | 19.3 (9.6, 29.1) | 6 |
| 09/2020 | 102.0 (71.3, 132.7) | 8 | 16.7 (1.9, 31.4) | 1 | 39.3 (21.6, 56.9) | 2 | 12.5 (5.8, 19.3) | 2 | 20.0 (10.2, 29.7) | 3 |
| 10/2020 | 108.7 (77.4, 139.9) | 55 | 17.4 (2.2, 32.5) | 13 | 42.5 (24.9, 60.2) | 24 | 16.0 (9.1, 22.8) | 5 | 20.4 (10.6, 30.2) | 8 |
| 11/2020 | 108.9 (77.1, 140.7) | 95 | 16.8 (1.3, 32.4) | 29 | 39.7 (22.1, 57.4) | 31 | 20.7 (13.8, 27.7) | 4 | 19.8 (9.9, 29.6) | 25 |
| 12/2020 | 98.8 (66.6, 131.1) | 111 | 15.6 (−0.3, 31.6) | 35 | 35.7 (18.0, 53.4) | 34 | 12.1 (5.0, 19.2) | 9 | 18.3 (8.4, 28.1) | 28 |

Non-seasonal and seasonal ARIMA parameters (p,d,q)(P,D,Q) for models were as follows: Total: (0,1,1)(1,0,1), Neglect: (1,1,0)(0,0,2), DV in presence of a minor: (1,0,1)(1,0,1), Physical abuse: (1,1,2)(1,0,0); Sexual abuse (1,1,1)(1,0,0).
continued and may have even increased to levels higher than that seen prior to the COVID-19 pandemic during this time, especially in the presence of heightened risk factors (Storz, 2020; World Health Organization, 03/, 2020). Though our findings are correlational in nature – a limitation of our study – we posit our findings of lower criminal filings are likely due to interrupted child abuse and neglect surveillance and may only represent a small fraction of actual child abuse.

Aside from law enforcement and social service workers, which were also in reduced capacity and services during the pandemic, schools, hospitals and relatives are the top reporting sources of child abuse in Oklahoma (Robinson, 2020). A potential reason for the largest deviation occurring in August and September is that caregivers plan for summer childcare and rely on children returning to school in order to return to work at full capacity – especially families who are less socially advantaged (Xu et al., 2021). As schools were provided more instructional guidance for virtual learning (Tiffany & Levi, 2020) and many districts returned to in-person learning in late September (Martinez-Keel, 2020), reports of abuse and neglect started increasing. The filing trends normalising, or exceeding estimated projections in the case of neglect, near the end of the year may be the result of increased family interactions during the holidays or of some schools reopening under the advice of the American Academy of Paediatrics (American Academy of Pediatrics, 2021) and the Centers for Disease Control and Prevention’s recommendations (Honein et al., 2021). The relative increase in neglect over projected filings in December of 2020 also likely points to the further erosion of financial safety nets during a time of extreme stress and economic hardship as America endured the worst wave of the pandemic.

Interrupted surveillance during the COVID-19 pandemic could leave sentinel injuries from abuse untreated – likely leading to further complications or more severe subsequent injuries from ongoing, inescapable abuse. Further, emotional trauma resulting from abuse and neglect, particularly without access to support, is likely to have long-lasting impacts, as adverse childhood experiences can detrimentally affect individuals well into adulthood (Anda et al., 2006). The inadvertent cost of school closures and lockdown measures on children may bear significant psychosocial consequences (Ghosh et al., 2020; Liu et al., 2020) in a state that is already burdened with a high prevalence of child abuse and neglect. While the COVID-19 pandemic has highlighted the importance of telehealth and its vital role during disasters in Oklahoma (Canady, 2020), its use for identifying abuse or neglect among children has limitations (Racine et al., 2020). Therefore, supporting organisations that provide social services during natural disasters, national emergencies and pandemics is essential for mitigating child abuse risk factors.

Regarding future pandemics and child abuse, prioritising support and resources, including vaccinations and personal protective equipment, to educational facilities to allow for minimal interruption to in-person learning may serve to protect children from prolonged abuse by preventing impaired surveillance. In the event of a future pandemic, targeted economic relief and childcare resources should be administered to families swiftly and consistently throughout the course of the pandemic. Future research should be done evaluating the impact of the COVID-19 pandemic on families to better prepare social service systems for future pandemics. Beyond these targeted approaches, supporting a strong vaccination effort in Oklahoma will play an important role in reopening schools safely, limiting the untoward effects of lockdown measures and bringing us closer to ending the pandemic.

ACKNOWLEDGEMENTS
Micah Hartwell had access to data received for the study and takes responsibility for the integrity and accuracy of the data analysis.

ETHICS STATEMENT
We submitted the methodology used herein for this study to an institutional review board which determined this study did not constitute human subjects research.

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REFERENCES
American Academy of Pediatrics. (2021) COVID-19 Guidance for Safe Schools. American Academy of Pediatrics. Available from: https://www.aap.org/en-news-room/news-releases/aap/2021/american-academy-of-pediatrics-updates-guidance-on-school-safety-amid-pandemic/ [Accessed 11th January 2021].
Anda, R.F., Felitti, V.J., Bremner, J.D., Walker, J.D., Whitfield, C., Perry, B.D. et al. (2006) The enduring effects of abuse and related adverse experiences in childhood. A convergence of evidence from neurobiology and epidemiology. European Archives of Psychiatry and Clinical Neuroscience, 256(3), 174–186. Available from: https://doi.org/10.1007/s00406-005-0624-4
Annie E. Casey Foundation. (2020) 2020 KIDS COUNT Data Book. Available from: https://www.aecf.org/m/databook/2020KC_profile_OK.pdf [Accessed 11th January 2021].
Bradbury-Jones, C. & Isham, L. (2020) The pandemic paradox: The consequences of COVID-19 on domestic violence. *Journal of Clinical Nursing*, 29(13-14), 2047–2049. Available from: https://doi.org/10.1111/jocn.15296

Canady, V.A. (2020) COVID-19 outbreak represents a new way of mental health service delivery. *Mental Health Weekly*, 30(12), 1–4. Available from: https://doi.org/10.1002/mhw.32282

Carter, R. (2020) Crime may be unaffected by COVID-19, while lawsuits proliferate. Oklahoma Council of Public Affairs. Available from: https://www.sos.ok.gov/documents/executive/1919.pdf [Accessed 7th February 2021].

Cunningham, J.K. & Liu, L.-M. (2008) Impact of methamphetamine precursor chemical legislation, a suppression policy, on the demand for drug treatment. *Social Science & Medicine*, 66(7), 1463–1473. Available from: https://doi.org/10.1016/j.socscimed.2007.12.006

Dhahri, I. & Chabchoub, H. (2007) Nonlinear goal programming models quantifying the bullwhip effect in supply chain based on ARIMA parameters. *European Journal of Operational Research*, 177(3), 1800–1810. Available from: https://doi.org/10.1016/j.ejor.2005.10.065

Erdogdu, E. (2007) Electricity demand analysis using cointegration and ARIMA modelling: A case study of Turkey. *Energy Policy*, 35(2), 1129–1146. Available from: https://doi.org/10.1016/j.enpol.2006.02.013

Flory, K., Hankin, B.L., Kloos, B., Cheley, C. & Turecki, G. (2009) Alcohol and cigarette use and misuse among Hurricane Katrina survivors: psychosocial risk and protective factors. *Substance use & Misuse*, 44(12), 1711–1724. Available from: https://doi.org/10.1080/10826080902962128

Ghosh, R., Dubey, M.J., Chatterjee, S. & Dubey, S. (2020) Impact of COVID-19 on children: special focus on the psychosocial aspect. *Minerva Pediaetrica*, 72(3). Available from: https://doi.org/10.23736/s0026-4946.20.05887-9

Honein, M.A., Barrios, L.C. & Brooks, J.T. (2021) Data and Policy to Guide Opening Schools Safely to Limit the Spread of SARS-CoV-2 Infection. *Clinical Pediatrics*, 59(9-10), 853. Available from: https://doi.org/10.1177/0009922820927044

Hyndman, R.J. & Khandakar, Y. (2008) Automatic time series forecasting: the forecast package for R. *Journal of Statistical Software*, 27(1), 1–22. Available from: https://doi.org/10.18637/jss.v027.i03

Liu, C.H. & Doan, S.N. (2020) Psychosocial Stress Contagion in Children and Families During the COVID-19 Pandemic. *Clinical Pediatrics*, 59(9-10), 853–855. Available from: https://doi.org/10.1177/0009922820927044

Liu, J.J., Bao, Y., Huang, X., Shi, J. & Lu, L. (2020) Mental health considerations for children quarantined because of COVID-19. *The Lancet Child & Adolescent Health*, 4(5), 347–349. Available from: https://doi.org/10.1016/s2352-4642(20)30096-1

Martinez-Keel, N. (2020) OKC schools plan dates for in-person return to classes. Oklahoman. Available from: https://www.sos.ok.gov/documents/executive/1919.pdf [Accessed 2nd February 2021].

Matic, D. & Matic, V. (2020) Impact of COVID-19 and non-pharmacological measures on children and adolescents: A narrative review. *Mental Health Weekly*, 30(12), 105258. Available from: https://doi.org/10.1002/mhw.32282

Oklahoma in 2020. Available from: https://www.oklahoma.gov/content/dam/ok/en/okdhs/documents/searchcenter/okdhs-publication-library/61940.pdf [Accessed 21st January 2021].

Polansky, C. (2020) Stitt administration choosing to no longer receive weekly White House Coronavirus task force reports. Available from: https://www.publicradiotulsa.org/post/stitt-administration-choosing-no-longer-receive-weekly-white-house-coronavirus-task-force#stream/0 [Accessed 22nd January 2021].

Racine, N., Hartwick, C., Collin-Vézina, D. & Madigan, S. (2020) Telemental health for child trauma treatment during and post-COVID-19: Limitations and considerations. *Child Abuse & Neglect*, 110(2), 104698. Available from: https://doi.org/10.1016/j.chiabu.2020.104698

Robinson, C. (2020) Child abuse statistics and data for fiscal year 2019 (No. S19040). Oklahoma Human Services: Child Welfare Services and Office of Performance Outcomes and Accountability. Available from: https://oklahoma.gov/content/dam/ok/en/okdhs/documents/searchcenter/okdhs-publication-library/61940.pdf [Accessed 21st January 2021].

Storz, M.A. (2020) Child abuse: A hidden crisis during covid-19 quarantine. *Journal of Paediatrics and Child Health*, 56(6), 990–991. Available from: https://doi.org/10.1111/jpc.14734

Tiffany, N. & Levi, P. (2020) COVID-19 outbreak represents a new way of mental health service delivery. *Mental Health Weekly*, 30(12), 1–4. Available from: https://doi.org/10.1002/mhw.32282

Wyatt, T.M., Dejong, W. & Dixon, E. (2013) Population-level administration of AlcoholEdu for college: an ARIMA time-series analysis. *Journal of Health Communication*, 18(8), 898–912. Available from: https://doi.org/10.1080/10810730.2011.626501

Xu, Y., Jeddwab, M., Soto-Ramirez, N., Levkoff, S.E. & Wu, Q. (2021) Material hardship and child neglect risk amidst COVID-19 in grandparent-headed kinship families: The role of financial assistance. *Child Abuse & Neglect*, 121, 105258. Available from: https://doi.org/10.1016/j.chiabu.2021.105258

How to cite this article: Hartwell, M., Hendrix, A.D., Saijadi, N.B., Baxter, M.A., Chesser, T., Coffey, S. et al. (2022) Child maltreatment during COVID-19: Deviations from forecasted projections of criminal filings in Oklahoma in 2020. *Child Abuse Review*, 31(4), e2754. Available from: https://doi.org/10.1002/car.2754