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Process mining the trajectories for adolescent-to-mother violence from longitudinal police and health service data

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Abstract

Aim: The aim was to discover longitudinal trajectories and patterns of events preceding adolescent-to-mother family violence in a geographic locale in Australia.

Design: This was a retrospective case series.

Methods: Routinely collected administrative data were sourced and linked from police and health service electronic records for adolescents born between 1994 and 2006 who had been issued a legal action for a family violence-related offence ($n = 775$). A time-stamped log of events from birth (where available) was created. Process mining was employed to discover dominant events and trajectories in the log from birth until adolescents' first recorded offence against their mother.

Results/Findings: Most adolescents in the case series offended against mothers (63%, $n = 486$). Trajectory analysis confirmed dominant early childhood events were repeated exposure to parental intimate partner violence (P-IPV), parental drug and/or alcohol use and neglect. During early adolescence, pathways towards adolescent-to-mother violence involved other offending, drug and/or alcohol use and mental health service contact.

Conclusion: The trajectories evidenced provide a complex picture of the emergence of adolescent-to-mother violence. From an early intervention perspective, it was found that many children and mothers were identifiable from police records in early childhood, at an average age of 35 months. Responses to adolescent family violence need to acknowledge the impact of childhood trauma and emerging mental health problems, along with strategies to mitigate the effect of P-IPV on mother-to-child relationships.

Impact: This is the first large-scale study to specifically examine trajectories from birth for adolescents who engage in violence towards mothers. The findings have important implications for the design and delivery of early intervention childhood services and interagency collaboration in nursing and midwifery services. In early adolescence, contact with mental health services represents an opportunity for screening and support interventions. This is an important preventive timepoint for family violence, adolescent drug and alcohol use and other offences.

KEYWORDS
adolescent-to-mother violence, child health, childhood and adolescent mental health, family violence, nursing, process mining, trauma

1 | INTRODUCTION

1.1 | Background

Over the last two decades, adolescent-to-parent violence has been increasingly recognized as a specific form of domestic and family violence (D&FV). Research evidence confirms that this violence is common. Available data on worldwide prevalence suggest rates of 5%–21% for physical violence and 30%–90% for psychological violence (Simmons et al., 2018). In Australia, up to ten percent of families are affected by adolescent-to-parent violence involving a police report (State of Victoria, 2016).

By definition, adolescent-to-parent violence refers to abusive or violent behaviour towards a parent by a child where the child has reached the age they can be legally held responsible for their behaviour. The intention to threaten, exert power or control (Cottrell & Monk, 2004) or cause damage and harm to a parent through a pattern of behaviours is said to be a distinguishing feature of adolescent-to-parent violence (Holt, 2013). The behaviours include physical violence, property damage, verbal abuse, coercive and controlling behaviours, and financial abuse from an adolescent child (Holt, 2013).

For mothers, the experience of violence or abuse from their adolescent child can impact physical, emotional and financial well-being (Edenborough et al., 2008; Holt, 2013). Mothers who experience violence or abuse from their adolescent child report living in fear for their safety and the safety of their other children (Cottrell & Monk, 2004; Edenborough et al., 2008; Williams et al., 2016). These mothers also report that ongoing abuse from a child has caused them to stop working or become isolated from friends and extended family (Jackson, 2003; Williams et al., 2016). Women experiencing violence and abuse from a child are often reluctant to seek help out of shame or denial of the seriousness of the abuse, with many fearing their child may be removed or the violence will escalate as a consequence (Peck et al., 2021a).

Even though mothers are known to be the primary victims of adolescent-to-parent violence, a discrete focus on mothers as the target of this violence continues to receive limited attention. In the 20 years since the landmark study by Edenborough et al. (2008), adolescent-to-mother violence has largely remained hidden under the umbrella of 'parent' violence. Clearly labelling a child's violence towards their mother, and understanding the roots of this violence, may help break down the shame and guilt mothers report and their reluctance to seek help (Peck et al., 2021a). Importantly, clearer labelling and identification of this violence may also assist nurses to implement more optimal and timely responses. This is important as nurses and midwives have unique potential to take a proactive role in the lives of these women and children, as most, if not all, of these mothers will have contact with nurses or midwives at crucial points in their trajectory towards adolescent-to-mother violence. Through prenatal screening and early childhood assessments, nurses and midwives may identify women experiencing or at risk of violence. This focus on women provides nurses with valuable insight into the lives of at-risk children and infants. From a research and early intervention perspective, this insight may contribute towards a more nuanced understanding of longitudinal patterns of risk and protective factors that stem from exposure to parent intimate partner violence (P-IPV) in early childhood to adverse outcomes in later childhood and adolescence.

Although links have been drawn between adolescent family violence and adverse childhood environments, including exposure to P-IPV, systematic review evidence confirms that longitudinal studies exploring the association between exposure to P-IPV and adolescent outcomes are limited. Of 122 studies examining the consequences of P-IPV exposure for children (Lourenço et al., 2013), only 10 were longitudinal. In Chiesa et al.'s (2018) review, the majority of studies examining exposure to childhood P-IPV were limited in their focus to children aged 0–5 years (Chiesa et al., 2018). Additionally, only 10 longitudinal studies have been published on the topic of adolescent-to-parent violence (Arias Rivera & Hidalgo García, 2020). Of these studies, five used samples of Spanish high school students, with a short time frame of follow-up (6 months to 1 year; see Arias-Rivera & Hidalgo Garcia, Arias Rivera & Hidalgo García, 2020). A further limitation of these studies is the small number of contributing factors examined to understand longitudinal relationships and reliance on adolescent or parent self-report data. Few studies of adolescent-to-parent violence have differentiated the pathways or predictors of mother violence compared to father violence.

The ability for data linkage of electronic records for the same individual and their family over time makes it possible to undertake large-scale life-course research. To date, however (especially within the field of adolescent family violence), techniques used to examine the predictive association between childhood factors and offending behaviour in adolescence and adulthood are limited in their ability to draw inferences about the underlying temporal trajectory relating to the observed variables (Barrett et al., 2014; Lussier et al., 2009). Embracing new methods of analysis, such as machine learning-related data discovery techniques, are yet to be employed to explore family violence trajectories across different points in the life course. Importantly, identifying developmental trajectories and predictors of risk will help target early interventions and address commonly held misconceptions about adolescent-to-mother violence.

2 | THE CURRENT STUDY

The current paper is drawn from a larger Australian data linkage study investigating the longitudinal trajectories and predictors of adolescent-to-parent violence offending.

2.1 | Aim

The aim was to discover the longitudinal trajectories and pattern of events (from birth where available) that precede adolescent-to-mother family violence.

2.2 | Design

A retrospective case-series design was adopted.

2.3 | Participants

A cohort of cases were born between 1994 and 2006 and had been issued a legal action for an adolescent-to-parent violence offence in a regional location in Australia before age 19 years. A legal action included a New South Wales Police Force (NSWPF) issued court attendance notice, criminal infringement notice, warning, caution or referral to a youth justice conference. An adolescent-to-parent family violence-related offence included family violence-related assault, malicious damage, offence against another person or sexual assault offences. The geographic area in New South Wales (NSW), Australia, has a population of 550,000 residents. The number of adolescents (per 100,000 of population) issued a legal action for a family violence-related assault incident in the area has been consistently above the state average over the past 10 years.

2.4 | Data collection

For each child in the series (n = 775), administrative data were sourced from the NSWPF Computerised Operational Policing System (COPS; data range 1995–2018) and three NSW Ministry of Health Data Collections: the Admitted Patients Data Collection (APDC; data range 2001–2018), the Emergency Department Data Collection (EDDC; data range 2005–2018) and the Mental Health Ambulatory Data Collection (MH-AMB; data range 2006–2018) from birth to 19 years (where available). In addition, parental data were sourced from the NSWPF COPS database.

The NSWPF COPS database stores all information recorded by employees of the NSWPF relating to everyday policing activities, including attending incidents, issuing legal actions and gathering intelligence. Information entered into the database for each incident attended or reported to the NSWPF includes: an incident category, incident start date and time, location, details of the people involved (classified by their type of involvement, i.e. person of interest [POI],[1] witness, victim, child-at-risk[2]) and other associated factors (i.e. whether the incident was domestic violence, drug or alcohol related[3]; NSWPF, 2010).

The NSW Ministry of Health APDC holds all inpatient separations (discharges, transfers and deaths) occurring in NSW public hospitals, public psychiatric hospitals, multi-purpose services, private hospitals and private day procedure centres. The NSW Ministry of Health EDDC records all patient presentations to emergency departments of public hospitals in NSW. These data collections include patients' demographic details, principal and secondary diagnoses, procedures undertaken and episode start and end dates. Diagnostics details are recorded using the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM) in the APDC and EDDC. The ICD-9-CM (Clinical Modification) and Systematized Nomenclature of Medicine - Clinical Terms (SNOMED-CT) are also utilized across emergency departments in NSW (NSW Ministry of Health, 2020a, 2020b).

The NSW Ministry of Health MH-AMB records data relating to the assessment, treatment, rehabilitation or care of non-admitted patients. Patient contact with mental health day programs and psychiatric outpatients, and mental health outreach services are recorded in this data collection. The information included in the MH-AMB consists of: the activity start date and time, the type of activity undertaken, the service provider, mental health primary and secondary diagnoses (recorded using ICD-10-AM) and patient demographics (NSW Department of Health, 2015).

The data sourced from these databases were determined by reviewing the research evidence on risk factors for adolescent-to-parent family violence (Peck et al., 2021b) and were deemed suitable for extraction from the data held by each agency. Table 1 details the data sourced from each database to create the event variables under study. The earliest available records for each adolescent were sourced depending on data availability within each data collection.

Record linkage was undertaken in 2019 by the Centre for Health Record Linkage (CHeReL). The centre is managed by the NSW Ministry of Health and provides dedicated data linkage services. The centre employs an automated blocking algorithm and machine learning to apply a linkage weight to pairs of records linked across databases (CHeReL, 2019).

2.5 | Ethical considerations

Prior to linkage, data custodian approval was granted by the NSWPF and NSW Ministry of Health. Ethical approval was obtained from a university (ECN-18-198) and a health services ethical committee (PHSREC 2019ETH00173).

2.6 | Data analysis

A total of 66,085 NSWPF or NSW Ministry of Health events were contained in the dataset. The development of an event log was the first step in the process mining method employed. At a minimum, each event recorded within an event log must contain data corresponding to the event undertaken, the case involved in the event (case identifier) and a timestamp (van der Aalst, 2012). After the final set of event variables was established (see Table 1), a longitudinal event-based record for each adolescent in the case series was created using Microsoft Excel (Version 1808). For each event in which

TABLE 1 Events included in the process mining and descriptive analysis with data description and data source

		Data source				
		NSWPF		NSW Ministry of Health		
Event variable	Included data	Adolescent	Parent	APDC	EDDC	MH-AMB
NSWPF-reported IPV exposure	D&FV related child-at-risk prior to 13 years. D&FV no-offence (verbal argument) victim. D&FV related assault victim.	X	 X X			
Parental drug and/or alcohol use	Person of interest in a drug-related incident. Person of interest in an alcohol-related incident.		X X			
Neglect	Neglect-related child-at-risk. Criminal/unsafe environment-related child-at-risk. Diagnosis of neglect, abandonment, maltreatment or problems relating to primary support group (ICD-10-AM: T74, T74.8-T74.9, Y06.0-Y06.09, Z59, Z61.8-Z61.9, Z62.4-Z62.5, Z63.7-Z63.79, Y07.01-Y07.09, Z63.9).	X X		X		X
Physical abuse child-at-risk (CAR)	Physical abuse-related child-at-risk. Diagnosis for physical abuse (ICD-10-AM: R45.6, T74.1, Z61.6).	X		X		
Family violence assault victim	Victim of a family violence-related assault offence. Diagnosis of assault by parent (ICD-10-AM: Y04.01, Y08.01, Y09.01) assault by family member (ICD-10-AM: Y04.02, Y08.02, Y09.02), assault by partner (ICD-10-AM: Y04.00, Y08.00, Y09.00).	X		X		
Family violence verbal argument victim	Victim of a D&FV – No offence (verbal argument) incident	X				
Sexual offence victim	Sexual abuse-related child-at-risk. Victim of a sexual offence (sexual assault, indecent assault, sexual offence-other). Diagnosis for sexual abuse or assault (ICD-10-AM: T74.2, Y05.00-Y05.99, Z61.4-Z61.5).	X X		X	X	X
Non-family violence assault victim	Victim of a non-family violence-related assault offence. Diagnosis of assault by other person (ICD-10-AM: Y04.03-Y04.09, Y08.03-Y08.09, Y09.03-Y09.09) or facial bone fracture (ICD-10-AM: S02.2- S02.69, S03.0, S05.2).	X		X	X	
Conduct or adjustment disorder	Diagnostic categories relating to neurodevelopmental, behavioural or conduct-related disorder diagnoses (ICD-10-AM: F63.8-F63.9, F91.3, F92.8-F92.9, F93.8-F93.9, F94.1, F94.8, F98.8-F98.9).			X	X	X
Stress/anxiety/ thought or other mental health disorders	Diagnosis for stress or anxiety disorder (ICD-10-AM: F06.33-F06.4, F23, F25.1, F32.00-F32.91, F33.0-F33.9, F40.8-F41.9, F43.0, F43.1, F43.8, F43.9, F50, F50.1, F92.0, F93.0-F93.2, R63), a thought disorder (ICD-10-AM: F06.2, F06.31, F07.0, F07.8, F07.9, F22.0, F22.8-F23.9, F24, F25.0, F30.8-F31.9, F44.81, F60.0-F61, F62.0-F62.9, F68.8) or mental or behavioural disorders due to use of alcohol or drugs (ICD-10-AM: F10-F19).			X	X	X
Mental diagnosis to be allocated	Contact with a mental health patient service where the principal mental health diagnosis is yet to be allocated.					X
Attempt suicide/ self-harm	Involvement in an attempted suicide incident. Diagnosis for suicidal ideation (ICD-10-AM: R45.81) or self-harm (ICD-10-AM: X70.0-X84, Y87, Z91.5).	X		X	X	X
Head trauma	Diagnosis for head trauma (ICD-10-AM: S01.88, S02.0-S02.9, S05.1, S06.00-S06.8, S07.9, S09.9).			X	X	

(Continues)

TABLE 1 (Continued)

Event variable	Included data	Data source				
		NSWPF		NSW Ministry of Health		
		Adolescent	Parent	APDC	EDDC	MH-AMB
Alcohol use	Person of interest involved in an alcohol-related incident. Diagnosis for alcohol use (ICD-10-AM: F10.0-F10.9, X45, X65, Z72.1, Z86.41) or mental or behavioural disorders due to use of alcohol (ICD-10-AM: F10).	X		X	X	X
Drug use	Legal action for an illicit drug offence. Person of interest involved in a drug-related incident. Diagnosis for drug use (ICD-10-AM: F11-F19, T42.4, T43.60-T43.62, T43.69, X60-X64, X40-X44, Z72.2, Z86.42) or mental or behavioural disorders due to use of drugs (ICD-10-AM: F11-F19).	X X		X	X	X
Family violence verbal argument person of interest	Family violence-related no-offence (verbal argument) incident person of interest.	X				
Apprehended violence order (AVO)	Family violence-related apprehended violence order (AVO) person of interest.	X				
Breach AVO	Breach AVO person of interest.	X				
Violent offence	Legal action for a non-family violence offence involving violence (i.e. assault, sexual offence).	X				
Property offence	Legal action for a non-family violence property crime-related offence (i.e. stealing, break and enter).	X				
Person search/move on	Person named in a police person search incident. Person named in a police move on incident.	X				

an adolescent was involved, the following details were recorded in the event log: the project person number (PPN), age at the time of the event, the date of the event, the event label, the event description and the data source. Figure 1 provides an overview of how the data were structured in the event log.

The event log was imported into the process mining software, *Disco* (Fluxicon, 2019). Disco (Fluxicon, 2019) employed a fuzzy miner algorithm to discover the events and the log-based ordered relationships between these events within the event log (Günther & Rozinat, 2012). The fuzzy miner algorithm used significance and correlation metrics to calculate which events and paths were included within the process model. The significance metric selected events and paths between events undertaken by a greater number of adolescents, and the correlation metric selected only pathways between closely connected events to include in the process model (van der Aalst, 2012).

To identify distinct trajectories for adolescent-to-mother violence offending, we mined only events for mother victims and their child. All event types were included in the analysis without any predetermined hypotheses. Frequency analysis, including percentages and means, was calculated for events and pathways in the model.

Descriptive analysis was also conducted to profile the adolescent-to-parent family violence offending characteristics of cases in the case series. An adolescent's first offence towards a parent was categorized employing the National Offence Index (NOI; Australian Bureau of Statistics, 2018) ranking. The NOI is a tool that provides an ordinal ranking of all offence categories in the Australian and New Zealand Standard Offence Classification (ANZSOC) by perceived seriousness. Offences are ranked on a scale of 1 (most serious) to 185 (least serious). Offences with a NOI ranking from 1 to 29 were classified as involving serious violence, rankings from 30 to 32 involving violence, 33 to 47 involving threats of violence and 49 to 181 involving property or other offences. Bivariate chi-square tests were conducted to explore differences in the proportion of adolescents involved in each event variable under study (Table 1) by victim type. This comparative analysis was undertaken to identify any significant differences in childhood adverse environment, adolescent mental health diagnoses and adverse police involvement between adolescents who committed offences against only mothers compared to adolescents who committed offences against only fathers. Chi-square analysis is suited to parametric and non-parametric analysis, and our sample size met the minimum requirements (McHugh, 2013).

2.7 | Rigour estimates of the process model

The process models were imported into the *ProM 6.9* (Process Mining Group, 2018) process mining software to assess the quality of the discovered models. Fitness metrics, on a scale of 0 to 1 were reported, with 1 representing perfect replay fitness of the model to the event log (Buijs et al., 2012).

3 | RESULTS

For the period 2008–2018, a total of 535 boys and 240 girls were issued a legal action by the NSWPF for an adolescent-to-parent violence offence in the geographic locale of the study. Overall, mothers were more likely to be victims of this family violence (63% $n = 486$), with mother-only violence occurring at 3.3 times the rate of father-only violence.

The average age at first adolescent-to-mother family violence offence was 15.31 years ($SD = 1.75$), with girls ($M = 15.07$ years, $SD = 1.70$) being slightly younger than boys ($M = 15.42$ years, $SD = 1.76$). First offences against a mother predominantly involved a form of assault (57%, $n = 276$) or property damage (31%, $n = 151$). Proportionately more girls than boys committed a violent first offence against their mother (girls: 67%, $n = 104$; boys: 52%, $n = 172$, $\chi^2[3] = 14.86$, $p = .002$). Just over a third of all adolescents in the study cohort (35%, $n = 275$) were involved in repeated family violence offending against their mother within the data collection period.

3.1 | Discovering the trajectories for adolescent-to-mother violence offending

The discovery process mining identified temporal correlations between the time-ordered events from birth (where available) to an adolescent being issued a legal action by the NSWPF for an offence against their mother. The final model contained 23 nodes and 40 arcs (see Figure 2) and had a fitness of .78, suggesting that 78% of the paths displayed in the process model accurately represented how the event data were recorded in the event log. Table 2 details how to read the model.

3.1.1 | The trajectory in early childhood

The dominant root event in the process model (see Figure 2) was parental intimate partner violence (P-IPV). Sixty-eight percent of adolescents who engaged in violence against their mother were exposed to P-IPV ($M_{\text{age at first recorded exposure}} = 3.38$, $SD = 3.72$). For families where P-IPV occurred, 86% recorded repeat P-IPV ($M_{\text{exposure incidents}} = 7.18$, $SD = 5.23$) at an average of 38 weeks since first exposure. Furthermore, in most families (78%) where adolescent-to-mother violence occurred, parental drug and alcohol use was linked to repeat P-IPV, and both parental drug and alcohol use and P-IPV were linked to child neglect and child physical abuse. Thus, for most adolescents in our sample, the early years of childhood were characterized by exposure to repeated incidents of NSWPF-reported family violence.

3.1.2 | The trajectory of late childhood and adolescence

During later childhood and adolescence, the main pathway towards being issued a legal action for an adolescent-to-mother violence offence involved a series of linked childhood offences and substance use, including non-family violence-related property ($n = 180$, $M_{\text{age}} = 13.90$, $SD = 1.49$) and violence offences ($n = 108$, $M_{\text{age}} = 14.27$, $SD = 1.58$), alcohol use ($n = 203$, $M_{\text{age}} = 14.86$, $SD = 1.62$), apprehended violence orders ($n = 292$, $M_{\text{age}} = 15.12$, $SD = 1.67$) and breaches of these orders ($n = 88$, $M_{\text{age}} = 14.96$, $SD = 1.70$), followed by drug use ($n = 197$, $M_{\text{age}} = 14.87$, $SD = 1.89$). Alcohol and drug use were concomitant with adolescents being issued a legal action for violent offences against non-family members and being the victim of a non-family violence-related assault offence. During this period, 44% ($n = 212$) of adolescents in the process model were issued NSWPF legal actions for non-family violence-related offending, with over half of these adolescents ($n = 142$) issued legal actions on more than one occasion.

3.1.3 | Events preceding adolescent-to-mother violence offending

The events closely preceding adolescent-to-mother violence offending were largely the adolescent's contact with a health service

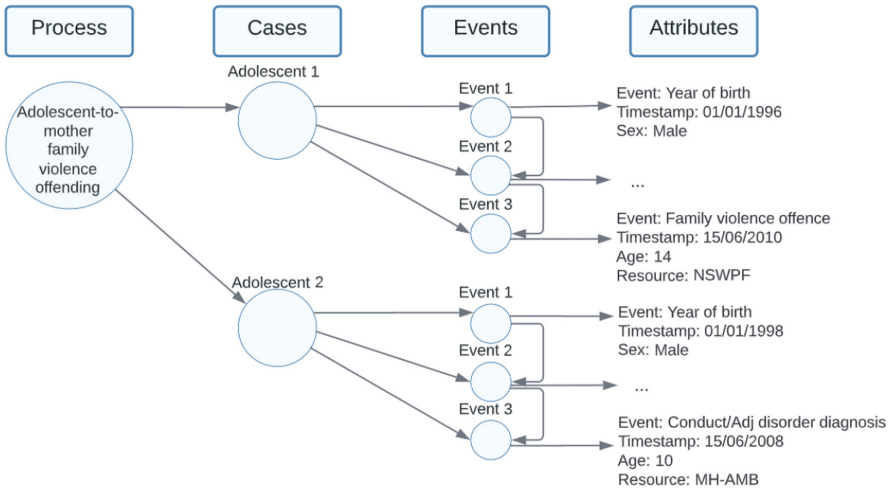

FIGURE 1 Structure of the data within the event log. *Note*. The figure displayed is based on van der Aalst (van der Aalst, 2012, p. 100).

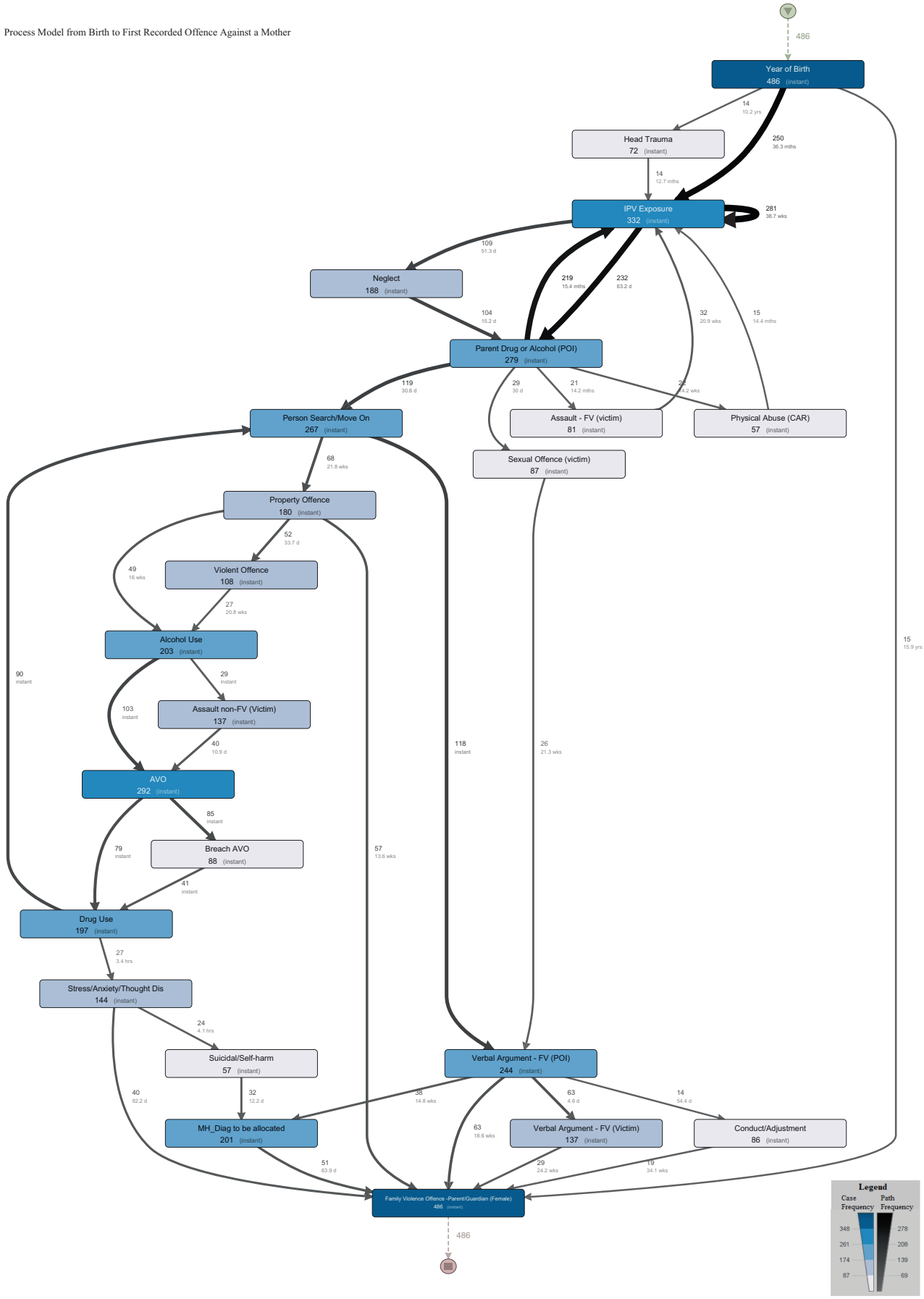

FIGURE 2 Process model from birth to first recorded offence against a mother

TABLE 2 Process model constructs

Construct	Name	Description
	Source	Start of the model
	Sink	End of the model
	Path	The direction of the arrows represents the order in which the events occurred. Numbers on the lines show a count of the number of adolescents involved in that direct path. Time shows the mean duration from one event to the next, with 'instant' suggesting the events occurred simultaneously on average. The more frequent a path between event variables, the thicker the line is displayed
	Event	Event variable label. The number represents a count of the number of adolescents recorded on one or more occasions in the event log for that event. The greater the number of adolescents involved in that event, the darker it is displayed

for emerging mental health problems or behavioural disorders and family violence verbal arguments involving police attendance or report to police. Prior to engaging in violence towards their mother, half of all adolescents had attended a health service and received a diagnosis of mental health diagnosis to be allocated, with an average of 63–82 days between the mental health diagnostic event and adolescent-to-mother violence. For adolescents who received a diagnosis prior to offending (n = 184), almost 80% (n = 144) received a diagnosis for a stress, anxiety, thought or other mental health disorder.

3.1.4 | Comparison between mother-only and father-only adolescent-to-parent violence

Table 3 compares involvement in each event variable understudy for adolescents who committed offences against only mothers (n = 309) to those who committed offences against fathers only (n = 92). To examine any differences in mother and father violence, adolescents involved in offending against multiple family members (n = 374) were excluded from this analysis. For both mothers and fathers, adolescent mental health was a common preceding event prior to offending. Offending towards mothers was significantly associated with adolescent exposure to P-IPV. In contrast, offending towards fathers was significantly associated with adolescent apprehended violence orders, adolescent alcohol use and adolescent non-family violence-related assault victimization.

4 | DISCUSSION

The longitudinal trajectories of NSWPF and NSW Ministry of Health service involvement evidenced in this study provide a complex picture of the emergence of adolescent-to-mother family violence. Many adolescents in the case series had substantial long-term involvement with police services throughout childhood, with almost half of adolescents (48%, n = 232) recorded for exposure to NSWPF-reported P-IPV and NSWPF recorded parental drug and/or alcohol use during early childhood. During later childhood and early adolescence, pathways towards adolescent-to-parent family violence offending involved other offending, drug and/or alcohol use and repeated mental health service contact.

To the best of our knowledge, this study is the first to use official police records of both parental verbal arguments and IPV-related offences to map the longitudinal pattern of exposure and the association with adolescent-to-mother family violence offending and other adverse childhood outcomes (Holmes et al., 2022). By including NSWPF-reported verbal arguments, as well as all reported P-IPV incidents in which a parent was recorded as a victim, or the adolescent as a child-at-risk, as the measure of P-IPV exposure, the current study found that children were exposed to P-IPV from a younger age ($M_{\text{age at first exposure}}$ = 3.28 years) than previously reported (Orr et al., 2021; M_{age} = 6.21 years). The age at which children are exposed to violence is important to identify, especially from a brain development perspective, as early intervention provides the opportunity to mitigate potential long-term harm and other adversities (Mueller & Tronick, 2020). Recent longitudinal research examining the effects of exposure to P-IPV in a prospective pregnancy cohort of 615 mother–child dyads found that exposure to P-IPV was associated with higher odds of receiving a psychiatric diagnosis, emotional or behavioural difficulties, impaired language skills, asthma and sleep problems at age 10 years (Gartland et al., 2021). From an early intervention perspective, the current study found that 80% of children exposed to both P-IPV and parental drug and/or alcohol use could be identified before age five from NSWPF data holdings. Additionally, from an early-childhood mental health intervention perspective,

TABLE 3 Comparison of family adversity and violence events, birth to first offence, by parent victim

	Mother or female caregiver victim only ($n = 309$)		Father or male caregiver victim only ($n = 92$)		Chi-square		
	n	%	*n*	%	χ^2	OR	*p*
Childhood events							
Child neglect	96	31.1	28	30.4	.013	1.03	.908
Physical abuse child-at-risk (CAR)	27	8.7	13	14.1	2.296	.58	.130
Non-family violence assault victim	82	26.5	**40**	**43.5**	9.612	.47	**.002**
Sexual offence victim	43	13.9	7	7.6	2.584	1.96	.108
Parent drug and alcohol use	150	48.5	47	51.1	.183	.90	.668
P-IPV exposure	**200**	**64.7**	47	51.1	5.574	1.76	**.018**
Adolescent mental health diagnoses							
Conduct/Adjustment disorder	44	14.2	12	13.0	.298	1.11	.585
Mental health diagnosis to be allocated[a]	111	35.9	33	35.9	.000	.99	.993
Stress/anxiety/thought or other mental health disorders	89	28.8	23	25.0	.509	1.21	.475
Attempt suicide/self-harm	32	10.4	10	10.9	.020	.95	.888
Adverse police involvement							
Alcohol use	114	36.9	**47**	**51.1**	5.944	.56	**.015**
Drug use	106	34.3	30	32.6	.091	1.08	.763
Property offence	103	33.3	35	38.0	.697	.81	.404
Person search/move on	153	49.5	40	43.5	1.035	1.28	.309
Family violence verbal argument person of interest	137	44.3	40	43.5	.021	1.04	.884
Violent offence	54	17.5	22	23.9	1.913	.67	.167
Apprehended violence order (AVO)	159	51.5	**58**	**63.1**	3.833	.62	**.050**

[a]Children may have received more than one mental health diagnosis; % = the percentage of the column *n*.

we identified that 75% of children who received a stress/anxiety/thought or other mental health diagnosis or a conduct or adjustment disorder diagnosis and 73% of those diagnosed with later self-harm or attempted suicide were identified in early childhood for being exposed to co-occurring P-IPV or parental drug and/or alcohol use.

The current study found that adolescents exposed to P-IPV had almost twice the odds of offending solely against their mother compared to father-only offending. Considering this, reducing adolescent-to-mother violence clearly requires early childhood interventions that enable mothers to safely parent their children, build and maintain secure mother–child attachment and foster childhood mental health. Maternal psychoeducational programs provided by nurses, often in conjunction with social workers, such as ATTACH (Letourneau et al., 2020), Minding the Baby (Slade et al., 2020) and the Mothers in Mind (Jenney et al., 2022) are examples of interventions that aim to enhance mothers capacity to understand their own and their child's mental health. These programs assist mothers to regulate their own emotions and improve mother–child attachment, which may buffer the negative effects of adverse childhood environments and have been used effectively with mothers experiencing intimate partner violence.

One of the most striking findings in this study is the extent to which P-IPV was followed by a mosaic of childhood abuse and victimization. Overall, 48% ($n = 235$) of adolescents in the study cohort were recorded for exposure to a moderate or high number of adverse *childhood* experiences. These findings highlight the importance of prenatal screening for IPV and maternal child health assessments and home visits, as the later parental support is provided for at-risk children, the harder it is to achieve positive outcomes for these children in adolescence and adult life. Our findings suggest that a 10% reduction in the rate of adolescent family violence re-offending could be achieved by reducing childhood adversity for a 2-year period. More sustained reductions in childhood adverse environments would result in a greater reduction in violence. This highlights the importance of early childhood nursing services, particularly those targeted to families experiencing toxic stress. Preventive initiatives, especially those focusing on mothers known to be vulnerable, are likely to contribute to a decrease in adolescent violence. Our findings highlight the importance of interagency collaboration to ensure early pathways between services for these families.

Through the linkage of NSWPF and NSW Health data, the current study illuminated pathways from childhood victimization, early

adverse police contact, drug and/or alcohol use and emerging mental health issues before committing an offence against their mother. These findings build on the current body of adolescent-to-parent violence research in which many prior studies (with few exceptions) reporting on the mental health or substance use of adolescents involved in violence or abuse against a parent have primarily utilized self-report (adolescent and parental) measures or data sourced from judicial case file reports, with very few reporting diagnostic information (Peck et al., 2021b). The findings of this study confirm the relationship between substance use and adolescent-to-parent family violence offending is more nuanced than has been previously established (Beckman et al., Beckmann et al., 2021; Calvete et al., 2014; Calvete et al., 2013; Cottrell & Monk, 2004). The current findings highlight an association between both parental and adolescent substance use and adolescent-to-parent family violence, with the use of alcohol having a stronger association with father-only violence than mother-only violence.

Stemming from the robust data sourced in the current study, stronger associations between adolescent drug use and emerging mental health problems (Farris et al., 2021) and far higher rates of emerging serious mental illness were confirmed compared to other studies (Contreras & Cano, 2015). The rate of stress, anxiety, thought and other mental health disorders before age 19 (44%, $n = 342$) is much higher than in earlier studies of adolescent-to-parent family violence (30%; Contreras & Cano, 2015).

For children with emerging mental health problems, it is clear that mothers face considerable risk of violence during adolescence. Research evidence confirms the highest risk period for violence in individuals with a mental health diagnosis is the 2-month period following discharge from a mental health facility. Earlier studies of adult populations report that between 1% and 20% of individuals admitted to the hospital for a psychiatric admission are reported to engage in violence once discharged (Rolin et al., 2022). Our data extend this earlier research, with many mothers in our study experiencing violence from their child in the 2 months following their child's initial receipt of a mental health diagnosis. These findings have important implications for adolescent mental health services, as enhanced mental health responses may mitigate family violence and adolescent's pathways into the justice system.

Adolescents in the study cohort were, on average, aged 13.7 years at the time of their first mental health service contact. The average age at first offence for this group was 15.3 years. Importantly, mental health service contact was occurring well before legal assistance was sought. Considering this finding, there is an opportunity for mental health services to conduct screening for adolescent family violence, with both adolescents and parents. This screening may open up conversations about this violence and supports available for both the adolescent and the parent affected. Given that early detection and treatment are the best means for preventing persistent problems, more research is needed to investigate mothers' experience of violence in the years following initial adolescent mental health diagnoses. Clearly, adolescent mental health services must address the risk of adolescent-to-mother violence when initiating treatment for emerging adolescent mental health problems. Prior research has shown that mothers are more willing to seek assistance from services when they can attribute a cause to the behaviour of their child (Peck et al., 2021a).

Strikingly, even though close to half of the adolescents in our sample had received a mental health diagnosis, sentence outcomes resulting from an adolescent's first offence revealed that only 17% were dealt with under the Mental Health Act, and <3% received a mental health treatment order. Our findings confirm that two-thirds of adolescents were returned to the care of their family without any court-sanctioned intervention following an adolescent-to-mother violence incident, even though close to 40% had been in regular contact with mental health services and received a diagnosis of a mental health problem.

A further stand out result from our analysis is evidence of parents and adolescents' repeated contact with police over extended periods prior to their first mental health diagnosis. Half of all adolescents (50%, $n = 244$) were recorded by the police for being involved as a person of interest in one or more family violence-related verbal argument incidents prior to their first legal action for a family violence offence against their mother. Considering what we know about incidents of adolescent-to-parent family violence being underreported, this is unlikely to be the first time an adolescent had been abusive towards a parent. This initial contact with police represents an opportunity for family violence-specific intervention with the adolescent and their family, as well as an opportunity for referral to drug and alcohol and mental health-related services. Intervening at this point is especially important as involvement in family violence verbal arguments was associated with an increased rate of family violence re-offending. Models of interagency collaboration between mental health services and police, such as co-location of services and formalized consultation and advice pathways implemented to improve outcomes for adults, could be extended to working with families experiencing adolescent violence. This may divert children from justice pathways towards earlier mental health interventions.

4.1 | Limitations

Sourcing data from official police and health records has limitations. Many crimes and incidences of abuse and violence within families are known to be underreported. Incidents that are reported to police may represent the more severe cases and may not be representative of the general population of adolescents who engage in violence towards their mother. In addition, there may be other factors that contribute to the described trajectories that were not collected, such as: child protective services involvement, parental health and parental mental health.

5 | CONCLUSION

The results of this study demonstrate a complex interplay of adolescent-to-mother violence characterized and underpinned by

adverse childhood experiences, mental health and vulnerability. Considering that both mothers and children are likely to engage healthcare services prior to this violence, nurses are uniquely positioned to assess and identify potential adversity of trauma and violence to minimize the risk of future perpetration of violence. Importantly, identification of risk through maternal child health assessments is essential, as is the assessment of underlying trauma that may be manifested through mental health issues. Considering the child and mother within the child-to-mother violence dyad, where both can be perceived as victims, the provision of trauma-informed healthcare is needed for both parties. Furthermore, as evidenced in this study, the conceptualization of adolescent-to-mother violence needs to move from being conceptualized by delinquency, family violence and child welfare to the exploration of childhood adversity and the provision and need for mental healthcare.

AUTHOR CONTRIBUTION

AP, SP and MH designed the study, AP undertook the data preparation and statistical analysis. All authors have agreed on the final version and meet at least one of the following criteria (recommended by the ICMJE*): *https://www.icmje.org/recommendations/

1. substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
2. drafting the article or revising it critically for important intellectual content.

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CONFLICT OF INTEREST

No conflict of interest has been declared by the author(s).

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ENDNOTES

[1] An adolescent is recorded as a person of interest when they come under notice by the NSWPF as the result of their suspected involvement in a police incident. This involvement may or may not result in their arrest or legal action being issued.

[2] A child or young person, recorded by the NSWPF due to concerns for their safety, welfare or well-being.

[3] To be classified as 'domestic violence, drug or alcohol related,' the police officer recording the incident has reason to believe the individual or individuals involved in the incident were under the influence of alcohol or drugs, or the incident occurred between individuals currently or previous involved in a domestic relationship.

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