

Female reoffending trajectories in England from 2000 to 2020: A longitudinal administrative data study

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Abstract

As females are a minority group in the criminal justice system, they have often been neglected in criminological research. Research exploring offending trajectories has largely focused on male and mixed-gender samples and studies using female-only cohorts have been constrained by small sample sizes, short follow-ups and limited evidence from England. However, as rates of female imprisonment increase, it is ever more important that we attempt to understand females' engagement with the criminal justice system. This study used a linkage of the Police National Computer and the National Pupil Database to create a birth cohort of female offenders in England (N=196,089). The study explored their offending trajectories from the age of criminal responsibility (10 years) up to age 31 years. A latent class analysis identified a four-class model with the following classes: 'Life-course-persistent' (11%), 'Adolescent-limited' (54%), 'Young-adult-limited' (16%) and 'Adult-onset' (19%). These classes resemble those identified using male and mixed-gender samples. By identifying the key developmental patterns of female offending in England, this study provides an empirical basis for early identification and tailored support for those females most at risk of persistent offending.

Introduction

The UK has one of the highest female imprisonment rates in Western Europe¹. Women who are imprisoned have a significantly elevated prevalence of mental disorder, substance misuse, homelessness and traumatic life experiences²⁻⁶. Imprisonment may serve as a re-traumatising experience⁷, with female prisoners' rates of self-harm nearly five times higher than males'⁸. In addition, in 2020, over 17,500 children were estimated to have been separated from their mother as a result of maternal imprisonment⁹. Such separations are associated with insecurities of attachment, depression and an increased risk of antisocial behaviour¹⁰⁻¹². Despite the notable differences and impacts there has been little research about female offending and this is particularly true in England and Wales¹³. This may be because women tend to make up a small proportion of offenders, and their offences are on average less serious¹⁴, but the result of this absence is that most criminological theories and indeed criminal justice approaches are simply adapted from research and knowledge about males. We must therefore enhance our understanding of the developmental trajectories of female reoffending and their associated risk factors to inform prevention and intervention strategies, including reduced imprisonment and increased community-based sentencing strategies in this group¹⁵.

Developmental trajectories of offending explore the antecedents and course of offending behaviours across the lifespan¹⁶. Moffitt drew on developmental trajectory work to suggest that two main offending trajectories exist: life-course-persistent (LCP) and adolescent-limited (AL)¹⁷. LCP offending is characterised by an early onset of serious and diverse offending that persists across the life course, associated with a combination of neurodevelopmental and environmental risk factors. AL offending is characterised by less serious offending, mainly during the adolescent years, associated with a delinquent peer group and a gap between biological and social maturity. While both groups of offenders

were predominantly male, female offenders were more typically observed in the adolescent-limited group.

Since Moffitt's publication, life course trajectories of male offending from childhood into adulthood and their correlates have been well researched¹⁸. Methods used to identify groups have varied, with some studies using finite mixture modelling approaches¹⁹ and others using hard-coding methods and algorithms²⁰. Finite mixture modelling is a data-driven approach that estimates groups probabilistically, whereas hard-coding and algorithm methods use pre-defined rules or thresholds and do not account for population heterogeneity. Such work has cumulatively suggested that additional trajectories beyond LCP and AL offending exist, including late-onset escalating and early-onset desistant trajectories²¹. The exact number of groups identified appears to be moderated by methodological factors: for example, studies which used self-report rather than official data identified more offending trajectories²¹.

To date, most research exploring offending trajectories has been performed using male or mixed-gender samples (see²¹⁻²³ for reviews). Recent work using a mixed-gender birth cohort from the linked Police National Computer and National Pupil Database identified five offending trajectories (including an LCP, two ALs, and two late-onset)²⁴. However, these findings are likely to have been driven by the large proportion of male offenders in the sample. True heterogeneity in female re-offending patterns and characteristics of trajectories may be masked in such studies due to higher rates of male offending²⁵. Overall, research on female trajectories has found similar trajectory types to those in males but has also identified some important differences. While research has found female LCP groups²⁶⁻²⁸, women began offending at a later age^{29,30}, committed fewer violent and serious offences³¹ and were less likely to follow persistent offending trajectories compared to men. Some studies also find adult-onset trajectories that are more common or specific to females^{29,32}.

Despite the increased inclusion of females in trajectory research, studies to date do not typically consider females specifically and have limited sample sizes and follow-up times. Persistent female offending is a rare outcome, and studies with large sample sizes and follow-ups into adulthood are needed to further enhance our understanding of this group. Follow-ups into adulthood are also needed to investigate the presence of late-onset groups. Evidence using data from England is also rare; given international differences in justice system responses, robust evidence from individual countries is needed. As females experience different drivers of offending and distinct CJS responses and outcomes compared to males^{33,34}, it is important that we develop our understanding of offending pathways in females. Understanding the nature of these pathways allows us to develop targeted and time-specific interventions that can address the particular needs of offending females.

This study aims to address a gap in the current literature by exploring female offending trajectories from childhood to adulthood among females who were born between 1st September 1990 and 31st August

1997 with at least one recorded conviction or caution between January 2000 and December 2020. This study uses a large administrative linked crime and education dataset from England and a finite mixture modelling approach to explore whether distinct latent groups exist among female offenders. We hypothesised that life-course-persistent, adolescent-limited and adult-onset groups would be identified.

Methods

We used STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) and REporting of studies Conducted using Observational Routinely-collected Data (RECORD) recommendations for linked cohort data for the reporting of this paper^{35,36}. Ethical approval was obtained from King's College London in December 2023 (LRS-23/24-40150). Data access was granted by the data owners (Ministry of Justice [MoJ] and Department for Education [DfE]) in May 2024. Data cleaning and analysis was performed via the Office for National Statistics Secure Research Service (ONS SRS) using R Studio and MPlus³⁷⁻³⁹ and coding files will be made available on the corresponding author's GitHub account upon publication (ChristabelColes).

Data and Linkage

The study used a longitudinal birth cohort established using linked administrative crime and education datasets, with crime data derived from the Police National Computer (PNC) and demographic data (e.g. gender, date of birth, ethnicity) derived from the National Pupil Database (NPD). The PNC contains individual offence-level records of cautions and convictions for all individuals in the UK from age 10 years onwards (the age of criminal responsibility in England, Wales and Northern Ireland). The NPD contains education and social care records for all individuals in state education in England, as well as records for national assessments taken by individuals not in state education. Self- or parent-reported gender and ethnicity variables were taken from the NPD because the equivalent records in the PNC are recorded by the arresting police officer⁴⁰. Date of birth from the NPD was used to confirm age of offence from the PNC.

PNC and NPD data were linked in 2019 as part of the MoJ and Administrative Data Research (ADR) UK funded data linkage program, Data First. Linkage was performed using a probabilistic approach agreed between the MoJ and DfE⁴¹. The final match rate was around 77%. The sample therefore does not capture the full offender population but has been shown to be representative of it⁴².

Sample

The sample consisted of females born between 1st September 1990 and 31st August 1997, who had at least one recorded conviction or caution in the PNC from January 2000 to December 2020. Only individuals with a record in both the NPD census and PNC were used so that we could confirm gender and age (see supplementary materials [Supplementary Figure S1] for details on the data cleaning

process). After data cleaning, the final sample consisted of 196,089 females with a conviction or caution who had committed a total of 966,481 offences.

Descriptive characteristics were obtained from the DfE school census and included ethnicity, free school meal (FSM) eligibility and the income deprivation affecting children index (IDACI). In line with DfE data cleaning processes⁴³, where an individual's ethnicity varied over time, the most recent record was used. FSM eligibility is determined by parental income and receipt of certain benefits (with children from lower income families being eligible) and was created by combining records from school years to create an 'ever eligible' variable. IDACI scores refer to the proportion of children in an area living in an income-deprived household⁴⁴. Both measures are commonly used in research as proxy measures for socioeconomic disadvantage⁴⁵. As IDACI scores varied over time due to familial housing movements, the most recent score was used. Home Office (HO) offence group categories were used to describe the types of offences committed by the whole sample. Additional offence characteristics used to describe offending within trajectory groups were: ever being incarcerated (according to PNC disposal codes), total length of time an individual spent in custody, serious violent offending (based on the DfE MoJ definition of serious violence offending as robbery, possession of weapons and violence against the person offences⁴³), criminal career duration (years between first and last offence), median total number of offences and ever receiving a custodial sentence of under 12 months (as short sentences make up 63% of sentences given to females and are associated with increased rates of reoffending compared to community sentences^{6,46}).

For individuals born in 1990, offending information was available up until age 31 years. For those born in 1997, offending information was available up until age 24 years. See Supplementary Table S1 for a breakdown of the number of pupils in each academic year cohort.

Model variables

The following variables were created using offence age, offence type, offence date, HO offence codes and disposal codes from the PNC, and year of birth, month of birth and gender from the NPD.

Age at first offence

Individuals with missing or incorrect age in the PNC (age <10 years or age >31 years) were removed (N=6,144 [0.9%]). Age was then verified using year and month of birth in the NPD and individuals with inconsistent age records were removed (N=3,598 [0.5%]). Age at first offence was calculated by taking the earliest recorded offence age for each individual in the PNC. We then created a categorical age at first offence variable, with the following categories: Child (10-13 years), Adolescent (14-17 years), Young adult (18-20 years) and Adult (≥21 years). These age categories correspond with previous research on offending trajectories in a mixed-gender sample using this linked data²⁴. These age categories also align with research that defines developmental age groups^{47,48} and categories used by the MoJ to define prolific offenders⁴⁹.

Age at last offence

Age at last offence was created by taking the latest recorded offence age for each individual. We then created a categorical age at last offence variable with the following age categories: Juvenile (10-17 years), Young adult (18-20 years) and Adult (≥21 years). These are the same age categories used by the MoJ to define prolific offenders⁴⁹.

Offence history

We created a series of persistent offender variables which indicate whether an individual had committed more than the median number of offences (excluding zero) as a juvenile, young adult and adult. The median total number of offences committed by females from age 10-17 years was one, therefore a persistent juvenile offender was one who had committed two or more offences as a juvenile. A persistent young adult female offender was defined as an individual who had committed three or more offences from age 18-20 years. A persistent adult female offender was defined as an individual who had committed five or more offences from age 21 years onwards.

This allows an individual to be persistent in one age category but not persistent in another, or persistent in all age categories. This definition was used for a previous publication using this data²⁴. It is distinct from the MoJ's⁴⁹ definition of a prolific offender, in which the categories are mutually exclusive.

Violent offending

A violent offender was classified as an individual who had ever committed an offence defined as 'Violence against the person' or a contact sexual offence (according to HO offence codes).

Model covariates

Custodial sentence

Using PNC Disposal codes, a binary variable was created to indicate whether an individual had ever received a custodial sentence (not including suspended custodial sentences). This was used as a covariate, as individuals are largely unable to offend during periods of incarceration. This may mimic desistance and affect latent class membership, particularly for persistent offenders who are more likely to receive custodial sentences⁵⁰.

Statistical analysis

Latent class analysis (LCA) was employed to model female offending trajectories. LCA is a type of finite mixture modelling used to identify homogenous groups within heterogeneous populations⁵¹. It uses patterns of observed indicators to identify unobserved or latent groups. To prevent the model converging on local rather than global maxima, the number of random starts was set to 1000, and the number of final stage optimizations was set to 100. A maximum of 50 iterations were allowed in the initial stage.

The following steps were performed to select the model that best fit the data ⁵². A one-class (k) model was created, followed by models with k+1 latent classes, until models no longer converged. Log-likelihood, Bayesian information criteria (BIC), sample size adjusted BIC (aBIC) and Akaike information criteria (AIC) were recorded to compare model fit with subsequent models. The potential best-fitting models were then compared on these indicators. Models with the lowest BIC, aBIC and AIC values were favoured. These indicators give a measure of how well the model fits the data based on the penalized log-likelihood. Additionally, parsimony, class sizes, entropy and interpretability of classes within the context of previous literature were considered ⁵³. Posterior class probabilities were estimated and used to assign individuals to optimal groups based on the highest probability. Average posterior probabilities (AvePP) and odds of correct classification [OCC] are reported for classes in the final model. Values of over 0.8 for AvePP and 5 for OCC are considered good ^{54,55}.

The variables described above, age at first offence, age at last offence and persistence as a juvenile, young adult and adult were used as indicator variables for all latent class models. Models were developed with and without the violent offender indicator variable, to assess whether this impacted the model. When the optimum number of classes was identified, the custodial sentence variable was added to the model as a covariate ⁵⁶. A sensitivity analysis was performed, rerunning the final 4-class model, but including individuals whose age was not verified in the NPD (due to missing or incorrect data), in order to assess the impact of excluding these individuals on the final model.

Results

The demographic characteristics and offence characteristics of the final sample of female offenders are presented in Tables 1 and 2. Most individuals had their first interaction with the CJS as juveniles (age 10-17 years). This was also the most common age period to be classified as a persistent offender. Most individuals had never received a custodial sentence (96.1%) or committed a violent or contact sexual offence (86.9%). The most common offence type was summary offences excluding motoring (such as common assault and battery, betting and gambling, and television license offences) (40.0%), followed by theft offences (25.5%) (Table 2). Just 3.5% (N=34,084) of all offences resulted in a custodial sentence, mainly theft (31.9%) and summary offences excluding motoring (23.6%).

Table 1. *Offending and demographic characteristics of sample (N=196,089)*

	N
<i>First offence:</i>	
Child (10-13 years)	48,980 (25.0%)
Adolescent (14-17 years)	91,699 (46.8%)
Young adult (18-20 years)	29,082 (14.8%)
Adult (21-31 years)	26,328 (13.4%)
<i>Last offence:</i>	
Juvenile (10-17 years)	106,198 (54.2%)
Young adult (18-20 years)	38,536 (19.7%)
Adult (21-31 years)	51,355 (26.2%)
<i>Persistence:</i>	
2 or more offences as a Juvenile (10-17 years)	60,686 (30.9%)
3 or more offences as a Young adult (18-20 years)	25,265 (12.9%)
5 or more offences as an Adult (21-31 years)	24,235 (12.4%)
Ever been incarcerated	7,662 (3.9%)
Ever committed a violent or contact sexual offence	25,656 (13.1%)
<i>Ethnicity:</i>	
White	167,656 (85.5%)
Black	10,200 (5.2%)
Asian	5,609 (2.9%)
Mixed	9,282 (4.7%)
Other	1,493 (0.8%)
Unknown	1,849 (0.9%)

Ever eligible for FSM	103,562 (52.8%)
Median IDACI score	0.25

Note: Free school meals (FSM) (population baseline rates of eligibility are around 25% ⁵⁷); Income deprivation affecting children index (IDACI) – indicates that, as children, individuals in the sample lived in areas where on average 25.0% of children aged 0-15 were living in income-deprived families (in 2019, the highest local authority IDACI score was 0.32 ⁴⁴).

Table 2. *Counts of offence type and offences resulting in a custodial sentence.*

	Counts of offences (%)	Counts of offences resulting in custodial sentences (%)
01 Violence against the person	64,051 (6.6)	3,949 (11.6)
02 Sexual offences	1,112 (0.1)	260 (0.8)
03 Robbery	10,501 (1.1)	1,452 (4.3)
04 Theft Offences	246,903 (25.5)	10,881 (31.9)
05 Criminal damage and arson	11,269 (1.2)	403 (1.2)
06 Drug offences	42,634 (4.4)	1,916 (5.6)
07 Possession of weapons	13,245 (1.4)	1,025 (3.0)
08 Public order offences	17,834 (1.8)	1,326 (3.9)
09 Miscellaneous crimes against society	37,430 (3.9)	3,223 (9.5)
10 Fraud offences	24,052 (2.5)	1,122 (3.3)
11 Summary offences excluding motoring	386,267 (40.0)	8,060 (23.6)
12 Summary motoring offences	109,872 (11.4)	251 (0.7)
20 Unknown offences	1,311 (0.1)	216 (0.6)
<i>Total</i>	966,481 (100.0)	34,084 (100.0)

We estimated models from one to five classes. The addition of an extra class in the five-class model did not improve interpretability in the context of the previous literature, therefore results are not reported.

The model also failed to converge without significantly increasing the number of random starts. Goodness of fit statistics for the one- to four-class model are reported in Table 3.

Table 3. *Model fit statistics for 1 to 4 class model (n=196,089)*

	df	Log-likelihood	BIC	aBIC	AIC	Entropy	Class sizes
Model 1	87	-712629.2	1425356	1425331	1425274	-	100
Model 2	78	-611005.2	1222218	1222164	1222044	0.99	46/54
Model 3	69	-563364.0	1127045	1126962	1126780	0.97	54/20/26
Model 4	60	-538191.6	1076810	1076699	1076453	0.98	54/16/11/19

Note: df: degrees of freedom; BIC: Bayesian information criterion; aBIC: adjusted Bayesian information criterion; AIC: Akaike's information criterion.

Based on having the lowest BIC, AIC and aBIC values, class sizes and the interpretability of classes, a four-class model was selected as the best-fitting model. Adding the *Violent offending* variable to the model did not affect the number or nature of classes identified, and it was therefore not included in the final model. The classes' interpretation and sizes remained similar after including *custodial sentence* as a covariate. Fit statistics for the final four-class model, controlling for having ever served a custodial sentence, are reported in Table 4. All average posterior probabilities were over 0.9.

The profiles of the identified trajectories after adjusting for having served a custodial sentence can be seen below in Table 5. The 'Life-course-persistent' ('LCP') group was the smallest group identified, accounting for 11% of the sample. These individuals began offending across childhood and adolescence and continued offending into adulthood. These individuals were persistent as juveniles and showed mixed levels of persistence in young adulthood and adulthood. 'Adolescent-limited' offenders were the largest group, accounting for 54% of the sample. These individuals began offending as juveniles (mainly in adolescence) and had desisted when they reached adulthood. Persistence as juveniles was mixed. The 'Young-adult-limited' group accounted for 16% of the sample. These individuals offended in young adulthood only and persistence was mixed during this period. 'Adult-onset' offenders accounted for 19% of the sample. These individuals began offending after the age of 21 and were mixed in terms of persistence during adulthood.

Table 4. *Final model classes*

	mcap	AvePP	OCC
Class			
Life-course-persistent	0.11; 22,118	0.95	144.57
Adolescent-limited	0.54; 106,198	1.00	-
Young-adult-limited	0.16; 31,055	0.95	106.45
Adult-onset	0.19; 36,718	0.96	110.94

Note: mcap: max probability class assignment proportion; AvePP: Average posterior probability, OCC: odds of correct classification

Table 5. *Response parameter probabilities for 4 latent classes*

Trajectory:	Life-course-persistent	Adolescent-limited	Young-adult-limited	Adult-onset
	11% (N=22,118)	54% (N=106,198)	16% (N=31,055)	19% (N=36,718)
<i>Indicator variables:</i>				
First offence childhood (10-13 years)	0.43	0.34	0.03	0.04
First offence adolescence (14-17 years)	0.57	0.66	0.12	0.14
First offence young adulthood (18-20 years)	0.00	0.00	0.85	0.10
First offence adulthood (>21 years)	0.00	0.00	0.00	0.74
Last offence juvenile (10-17 years)	0.00	0.98	0.00	0.00
Last offence young adult (18-20 years)	0.36	0.02	0.96	0.00
Last offence adulthood (>21 years)	0.64	0.01	0.04	1.00
Juvenile persistence	0.95	0.37	0.00	0.00
Young adult persistence	0.46	0.00	0.44	0.05
Adult persistence	0.37	0.00	0.00	0.46

Note: %s below 0.30 or above 0.70 are presented in bold

Sensitivity analysis

The sensitivity analysis, including individuals whose ages could not be verified using NPD data, confirmed that excluding individuals with inconsistent ages in the NPD did not affect results (see Supplementary Table S2 for details of the sensitivity analysis model).

Characteristics of offending trajectories

Table 6 shows the offending characteristics of the sample according to trajectory membership. 'LCP' offenders were responsible for the largest proportion of offences (42%) despite making up the smallest proportion of the sample. Additionally, 19% of 'LCP' offenders had received a custodial sentence, compared to less than 1% of 'Adolescent-limited' offenders. Three percent of 'Young-adult limited' and five percent of 'Adult-onset' offenders, had received a custodial sentence. On average, 'LCP' offenders had records for 11 offences across the study period, while 'Adult-onset' offenders had four, 'Young-adult limited' had two and 'Adolescent-limited' had one. For a breakdown of total offences by offence type and trajectory type, see Supplementary Table S3.

Table 6. *Offence and education characteristics according to latent classes*

<i>Trajectory:</i>	Life-course-persistent (N=22,118)	Adolescent-limited (N=106,198)	Young-Adult-limited (N=31,055)	Adult-onset (N=36,718)
<i>Total offences committed</i> (% of cohort offences)	403,867 (41.8)	237,823 (24.6)	108,555 (11.2)	218,836 (22.6)
Ever incarcerated	4,237 (19.2%)	667 (0.6%)	933 (3.0%)	1,825 (5.0%)
Received a custodial sentence under 12 months	3,282 (14.8%)	445 (0.4%)	506 (1.6%)	1,099 (3.0%)
Serious violent offenders	7,780 (35.2%)	11,348 (10.7%)	2,424 (7.8%)	3,006 (8.2%)
Median total offences per person (IQR)	11 (16)	1 (1)	2 (4)	4 (5)
Mean age first offence (SD)	13.8 (1.7)	14.1 (1.6)	18.1 (1.9)	21.3 (3.9)
Mean age last offence (SD)	22.2 (3.3)	14.6 (1.6)	19.1 (1.1)	23.7 (2.3)
Median criminal career duration (IQR)	8 (6)	1 (0)	1 (0)	1 (3)
Ever been eligible for free school meals (FSM)	14,936 (67.5%)	55,733 (52.5%)	15,195 (48.9%)	17,698 (48.2%)
Median Income Deprivation Affecting Children (IDACI) score	0.29	0.25	0.24	0.24
<i>Ethnicity:*</i>				
White	19,049 (86.1%)	92,396 (87.0%)	25,779 (83%)	30,432 (82.9%)
Black	1,105 (5.0%)	4,624 (4.6%)	2,125 (6.8%)	2,346 (6.4%)
Asian	274 (1.2%)	2,821 (2.7%)	1,107 (3.6%)	1,407 (3.8%)
Mixed	1,356 (6.1%)	4,710 (4.4%)	1,458 (4.7%)	1,758 (4.8%)
Other	121 (0.5%)	728 (0.7%)	277 (0.9%)	367 (1.0%)

*Counts do not add up to total N of latent classes due to missing data (all classes had around 1% missing ethnicity data). Percentages may not add up to 100% due to rounding.

The median IDACI score in the 'LCP' group was 0.29; meaning that, as children, these female offenders lived in neighbourhoods where on average 29% of children lived in families with low-income. The other groups had similar median IDACI scores ranging from 0.24-0.25. Additionally, 68% of individuals in the 'LCP' trajectory had received free school meals at some point whilst at school, compared to 48-52% of individuals in the other trajectories. See Table Supplementary S4 for further demographic and offence characteristics of latent classes.

Discussion

Females have long been neglected in research on life course patterns of offending. It is key that we look at these patterns as they may allow us to distinguish between groups of offenders with distinct risk and recidivism factors and treatment/disposal needs. We used a large administrative sample from linked PNC and NPD data to identify subgroups of female offenders from the age of criminal responsibility (age 10 years) up to age 31 years. This is the largest study to date specifically exploring female offending trajectories and the first in England to explore female-only trajectories of reoffending from childhood well into adulthood with a nationally representative sample. We used latent class analysis to identify four groups with different patterns of onset, desistance and rates of offending: Life-course-persistent, Adolescent-limited, Young-Adult-limited and Adult-onset. While these groups resemble those found in previous literature using both male and female samples^{21,58}, the characteristics and associated risk factors for the identified groups are likely to differ between males and females. It is noteworthy that over 50% of the offending in this cohort was for summary offences (including motoring) and that these summary offences and theft accounted for over 76% of the offences, but that considerable serious offending was still observed. The findings contribute to our understanding of heterogeneity in female offending and demonstrate the need for developmentally and trajectory appropriate interventions.

We identified an LCP trajectory, resembling Moffitt's¹⁷ LCP group, that accounted for 11% of the sample. These offenders made up the majority of the incarcerated population in the sample (of the 7,662 individuals who had ever been incarcerated, 55% were classified as LCP offenders). This may reflect the high average number of offences committed by this group (11 offences per offender), as previous convictions are considered in sentencing decisions⁵⁹. Fifteen percent of LCP offenders had received custodial sentences of under 12 months. Such sanctions are commonly given to female offenders and are associated with increased reoffending rates compared to community-based sentences^{6,60}, although the baseline characteristics of these two groups may differ¹⁵. These offenders also displayed high rates of socioeconomic disadvantage with 68% eligible for FSMs compared to around 25% in the general population⁵⁷. As this group accounts for the largest share of offences among female offenders, they should be a priority for interventions. Early intensive interventions focusing on family⁶¹ and school environments⁶² may be beneficial for this group.

Female persistent offending is more likely to be linked to the antisocial influence of partners, mental health disorders and exposure to violence compared to male persistence²⁶. Qualitative perspectives also highlight the role of victimisation in driving young girls to commit particular offences (e.g. petty property offences and offences related to prostitution)⁶³. Recent research modeling offending trajectories among care-experienced individuals found that females who experienced out of home placements during adolescence were at the highest risk of becoming persistent offenders^{64,65}. Future research should further explore the early correlates and predictors of membership in this group. This may help to prospectively identify at-risk females for interventions in schools or other education settings, prior to offending onset. Interventions should target the gender-specific needs of high-risk females (e.g. family separation, substance misuse, and disconnection from school⁶⁶). This could allow us to more effectively distribute resources to offenders at higher risk of negative life outcomes. This may help to prevent the onset of these high-rate criminal careers, reducing the associated individual, societal, and inter-generational costs.

The Adolescent-limited offending group identified only committed offences as juveniles and made up around 54% of the total sample. This indicates that, in line with Moffitt's theory, this is the most common pattern of offending amongst females⁶⁷. It is unclear why these offenders desist, but this may be due to a narrowing of the gap between social and biological maturity over time¹⁷. Qualitative work exploring this adolescent group has identified delinquent peers and identity exploration as important factors for offending in this group⁶⁸. While this group appear to have significantly better later life outcomes than persistent groups⁶⁹, they do show deficits in other areas, such as educational attainment⁷⁰, indicating a need for support.

The Young-adult-limited group identified in this study made up 16% of the total sample. This group has recently been identified in male offender samples^{64,65}. They had higher rates of incarceration (3%) than Adolescent-limited offenders (0.6%). This may be due to differences in sentencing guidelines between adults and minors. Similar to the Adolescent-limited group, these offenders appeared to age out of offending as they matured. This group may have more protective factors than their persistent counterparts, e.g. active employment⁷¹. Previous research on female offenders has found that this group had similar risk factors to very low-level sporadic offenders⁷¹. They also experienced different outcomes later in life; for example, the majority of late-onset desisting offenders who married later experienced a divorce. Late adolescence may be a critical window for interventions in this group. Due to their age, it is key that this group does not fall in the gap between the rehabilitation-oriented youth justice system and the more punitive adult justice system. Services that support women in this transitional age period (e.g. with employment, housing, vocational skills) may help to prevent the onset of offending for these individuals.

Adult-onset groups have caused disagreements in previous literature, with some research maintaining that this group is an artifact of methodological factors and unidentified juvenile offences¹⁸. In our sample this group made up 19% of offenders. The late onset of this group indicates the need to

investigate adulthood risk factors for offending onset in females, and to potentially target specific interventions later in adolescence or early adulthood. These offenders may represent 'late-bloomers'⁷², a group who start offending during adulthood but reach the same level of offending as LCP offenders in later life. However, previous research also finds adult-onset groups that desist over time⁷¹. As our sample was only followed-up until age 31 years, it is unclear whether this group persists or desists throughout later adulthood. The later-onset of this group (at or after 21 years) may be explained by the presence of coping strategies and support networks in adolescence and early adulthood, that stop being effective as they experience the reduced social support and increasing demands that come with later adulthood⁷³.

Limitations

Finite mixture modelling (FMM) approaches, including latent class analysis, have typically been used to examine longitudinal patterns of offending¹⁹. Criticisms of FMM include the potential misinterpretation of identified groups as 'real' subgroups⁷⁴. It should be acknowledged that groups identified using FMM are not real entities but probabilistic approximations of patterns in outcomes and should therefore be interpreted accordingly.

Administrative offending records only account for offences that have been dealt with by the CJS. Offending rates are likely to be underestimated, particularly for young female offenders, who may be less likely to receive official sanctions due to committing less serious offences⁷⁵. It is estimated that the actual age of offending onset is around 3-5 years prior to an individual's first recorded offence⁷⁶. Official measures may also be a proxy for more serious offences as 'normative' adolescent offending may not be captured in these records⁷².

The maximum follow-up in this study was to age 31 years. While this is an improvement on much previous research (most studies that continue into adulthood do not follow-up past age 26), ideally follow-up would be further into adulthood. As the birth cohort used in this research ages, this information will become available for further analysis. Additionally, we have an uneven length of follow-up for individuals due to the seven-year span of the birth cohort (1990-1997). This means that our study end-point ranged from 24 to 31 years of age. This has the potential to influence latent class assignment: however, individuals in each birth year are relatively evenly distributed between identified trajectories (see Supplementary Table S4).

We could not control for mortality or migration, as neither the NPD nor PNC contain information on this. This may impact the groups identified, because if someone dies or emigrates, they will appear to have desisted from offending. Premature aging and early death are more common amongst persistent offenders^{77,78}, therefore this may have resulted in an under-identification of LCP offenders.

Future Directions

The current study exemplifies the power of using administrative data to answer questions related to public policy, using near whole-population samples with relatively low financial and time burdens. Recent work using UK administrative data, for example looking at changes in educational attainment and criminal offending⁷⁹ and the intersection between care experience, ethnicity and offending⁸⁰, shows the potential of using linked datasets to explore social justice issues. Further research on the social care and educational backgrounds of female offenders, particularly the LCP group identified, would help to guide research focused on gender-informed approaches that incorporate a Whole Systems Approach model from childhood onwards⁸¹.

Conclusion

This study has enhanced our theoretical understanding of female offending trajectories through harnessing a large administrative sample of female offenders convicted or cautioned for an offence in England between 2000 and 2020. This is the largest study looking at female-only trajectories to date. By using a large nationally-representative dataset we move beyond small-scale studies and provide a foundation for further gender-informed criminal justice policy research. We identified four distinct trajectories of offending among females and explored offence and some demographic characteristics of these groups. Our findings highlight the need for gender-responsive strategies that account for distinct female offending trajectories. Through developing our theoretical understanding of female offending patterns, we can inform criminal justice interventions to support and rehabilitate female offenders.

Declarations

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Author contributions

Authors HD, AW and CC contributed to the article conceptualisation. CC performed the data cleaning and analysis and prepared the original draft. CC was the only author to have access to the dataset. Authors AW, DJ, NB, and HD critically reviewed and edited the work.

Data availability statement

Data used for this research is accessible via an application by an ONS accredited researcher to the data owners (Ministry of Justice and Department for Education).

Additional Information (including a Competing Interests Statement)

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