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# Using longitudinal administrative data to characterise mental health problems and substance misuse among women whose children enter care in England

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# Declaration

I, Rachel Jane Beck Pearson, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Date: 2nd October 2021

Signature:

# Abstract

**Background** Maternal mental health problems and substance misuse are key risk factors for child maltreatment and are common among children entering care in England. Better evidence about the health needs of women whose children enter care is needed to inform prevention and service responses across the family courts, children's social care and healthcare.

**Methods:** I used area-level and person-level linked administrative data from health, children's social care and family justice in England. First, I performed an ecological analysis of the association between maternal health before birth and infant entry into care using national data. Next, I used linked mental health and substance use service use and family court data for 3226 women in court proceedings concerning their child(ren)s entry into care in the South London and Maudsley NHS Foundation Trust catchment. I generated evidence on the type, severity and timing of health problems and identified predictors for returning to court with a new child.

**Results** Parts of England with higher prevalence of maternal history of mental health, substance misuse or violence-related hospital admission among births had higher rates of infant entry into care, adjusting for potential confounders. Among women in proceedings in the SLaM catchment, 66% (of 3226) linked to a SLaM patient record and 54% were known to SLaM before their first recorded set of proceedings. Women who linked had high rates of schizophrenia spectrum disorders, personality disorders and substance misuse, compared to other female SLaM patients. They also had two-fold higher expected mortality rates, adjusted for age, and higher rates of service disengagement. I found six common trajectories of SLaM inpatient and outpatient contact among women in proceedings, which revealed that many (53%) women had little or no service contact around proceedings despite most having a SLaM referral. I found that being younger, having a young child in proceedings, and having parental responsibility curtailed or terminated were most predictive of returning to court with a new infant.

**Conclusions** Mental health problems and substance misuse are common among women involved in proceedings, with healthcare needs often acute and complex. Given the scale of this issue, family law and social care policy reform is needed to ensure adequate and timely treatment for maternal mental health problems.

# Impact Statement

Although mental health problems and substance misuse are common among mothers in England, little is known about these healthcare needs among women whose children enter state care. In the absence of robust empirical evidence regarding prevalence of, or the detail of health need (specific to this population), services may be limited in their ability to treat mental health and substance misuse and to prevent the reception of children into state care. This thesis tackles this issue via novel area-level and person-level data linkages, combining information about child entries to care and maternal health for research.

First, this thesis provides detailed evidence of the high rates of mental health problems and substance misuse experienced by women with children subject to court proceedings concerning entry into care in the South London and Maudsley NHS Foundation Trust (SLaM) catchment area using a population-based cohort. For example, I found that half of women in proceedings with a SLaM patient record had little or no service use in the two years before and one year after onset of proceedings, three-quarters of which had a SLaM referral over this period. This suggests large unmet need among this group in terms of access to SLaM services. I also provided the first estimates of mortality rates among women in proceedings who access mental health or substance misuse services in the SLaM catchment, highlighting that these women have much higher rates of mortality than other women accessing these services. This thesis will inform services working with this population locally and, when taken together with research from other areas in England, could also provide national insights for policy across children's social care, family justice, and healthcare.

Second, this thesis provides a framework for establishing and evaluating the accuracy of further linkages between family court data and electronic patient registers in England. I also demonstrate several analytical strategies that can be used to generate much needed evidence about the healthcare needs and health service use of women whose children enter care. This will support researchers seeking to establish similar linkages in other parts of the country, providing further local insights as well as opportunities for comparison studies which could be used to identify pockets of good practice among services. To ensure transparency of my analyses, and to support their re-use, the R code

for each of the analysis chapters is available from my GitHub page (https://github.com/RachelPearson).

I have also published three papers and one preprint based on chapters in this thesis which are listed in Appendix 0, alongside details of stakeholder engagement work.

# Acknowledgements

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# Abbreviations

| | |
|---|---|
| **ADCS** | Association of Directors of Children' Services |
| **AIC** | Akaike's Information Criterion |
| **ARA** | Adversity-Related hospital Admission |
| **BIC** | Bayes Information Criterion |
| **Cafcass** | Children and Family Court Advisory and Support Service |
| **CAG** | Confidentiality Advisory Group |
| **CDLS** | Clinical Data Linkage Service |
| **CLA** | Children Looked After return database |
| **CPS** | Child Protective Services |
| **CPRD** | Clinical Practice Research Database |
| **CRIS** | Clinical Research Interactive Search |
| **DfE** | Department for Education |
| **ePJS** | Electronic Patient Journey System |
| **EPR** | Electronic Patient Record |
| **GLM** | Generalised Linear Models |
| **GP** | General Practitioner |
| **IAPT** | Improving Access to Psychological Therapies |
| **ICD-10** | International Statistical Classification of Diseases and Related Health Problems 10th Revision |
| **IMD** | Index of Multiple Deprivation |

| | |
|---|---|
| **LA** | Local authority |
| **LCMM** | Latent Class Mixture Model |
| **LMM** | Linear Mixed-Effects Model |
| **LSOA** | Lower-Layer Super Output Area |
| **NDTMS** | National Drug Treatment Monitoring System |
| **NHS** | National Health Service |
| **NHS HRA** | NHS Health Research Authority |
| **NIHR** | National Institute of Health Research |
| **MoJ** | Ministry of Justice |
| **ONS** | Office for National Statistics |
| **OOHC** | Out-of-Home Care |
| **PHE** | Public Health England |
| **REC** | Research Ethics Committee |
| **SLaM** | South London and Maudsley NHS Foundation Trust |

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# Chapter 1: Background

**Chapter overview**

In this chapter, I provided the rationale for linking large-scale healthcare records and administrative data on women whose children enter state care in England to generate evidence about their healthcare needs. First, I introduced the focus of this PhD: mental health problems and substance misuse among women whose children enter state care and are involved in family court proceedings concerning entry into care. As child abuse and neglect (i.e., maltreatment) are the principal drivers of care placements in England and abroad, I discussed the pathways between maternal mental illness or substance misuse and child maltreatment and outlined the context in England with respect to maternal mental health problems and substance misuse, including an overview of children's social care and the family justice system. I then described and appraised existing research from England on mental health problems and substance misuse among women whose children enter care or are involved in family court proceedings concerning entry into care, highlighting the gaps and limitations. Throughout this chapter, I used a number of strategies to identify relevant literature. These strategies included Google Scholar searches, searching databases such as Scopus, PsycINFO and EMBASE, creating Google Alerts for key terms, and subscribing to newsletters produced by researcher networks that disseminate new research on child protection and children's social care. Finally, I presented my rationale and objectives for this PhD project .

## 1.1 Background

### 1.1.1 Introduction

Between 2010 and 2019, the annual rate of entry into care among children in England grew by 10%, from 24 to 27 entries per 10,000 children in England, while the number of applications by English local authorities to family courts to receive children into care rose by 37%, from 8.3 to 11.3 applications per 10,000 children in England.[1,2] The growing number of children that enter care in England has led to unsustainable increases to the English care population.[2,3] Other high-income countries, including Australia and the

United States, are also experiencing increased entries to care, leaving their child protective services similarly overstretched.[4,5]

The most frequently recorded reason for children entering care in England is abuse and neglect (i.e., child maltreatment).[2] Maltreatment in childhood has long-lasting consequences for health and wellbeing in childhood which often reach into adolescence and adulthood, [35,36] and, in rare cases, maltreatment can even cause serious injury or death. [6]

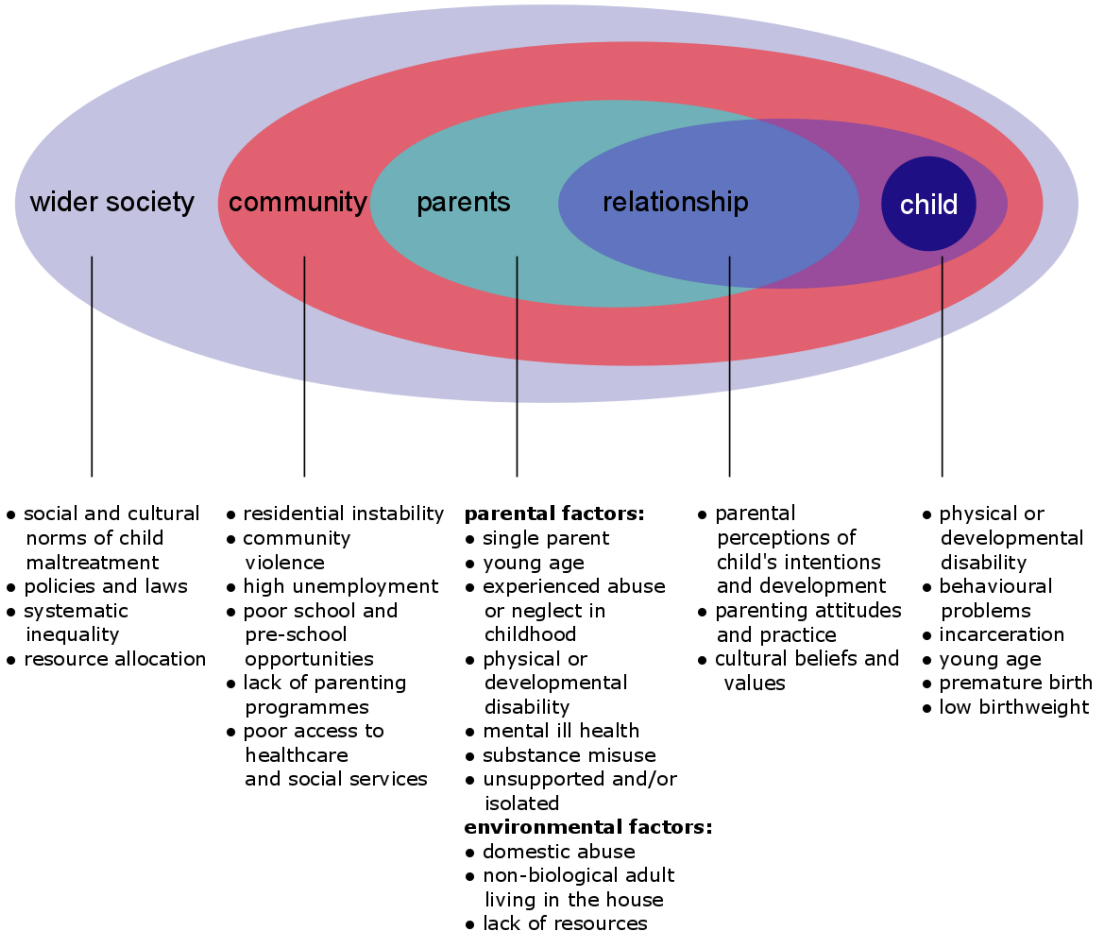
Recognising the ecological and interconnected nature of risk-factors for child maltreatment at different levels (from the child and family to the wider society), many have applied an ecological framework to this field of study over the years.[7–9] The ecological framework of child maltreatment below (Figure 1.1) builds upon previous diagrams and incorporates evidence from systematic reviews focussed on risk-factors for child maltreatment.[7,9–13]

While these systematic reviews highlight that entry into care is driven by a complex web of risk factors relating to children and their families, the local community, services, and wider society, they suggest that parental adversities, including mental health problems and substance misuse, are among the strongest risk factors for child and, therefore, child entry into state care.

This thesis focuses on maternal mental health problems and substance misuse among women whose children enter care or are involved in court proceedings concerned with entry to care. Mental health conditions include serious mental illness including schizophrenia and bipolar disorder (0.8% prevalence 26among women aged 15-74 years in England),[14] common mental health disorders including anxiety and depression, phobias, panic disorders, and OCD (between 20-25% prevalence among women aged 16 and over in England), post-traumatic stress disorder (5% prevalence among women aged 16 and over in England), personality disorders (14% prevalence among women aged 16 and over in England), and other mental health disorders such as eating disorders.[15] The average age of onset of each of these conditions falls within the ages when women typically start families (i.e., 20s and 30s).[16] I will also look at behavioural disorders with age of onset typically in childhood and adolescence such as conduct disorders and oppositional defiant disorder, as well as neurodevelopmental disorders such as autism

spectrum disorder and attention deficit hyperactivity disorder. Furthermore, in England, comorbidity of mental health illness and substance misuse is increasingly common,[17] providing rationale to study these two health needs together.

**Figure 1.1: An ecological framework describing drivers of child maltreatment**




In addition to the studies cited in the paragraph above, the design of this model was influenced by and adapted from the ecological model in Heise's 2011 report: What works to prevent partner violence? http://strive.lshtm.ac.uk/resources/what-works-prevent-partner-violence-evidence-overview

### 1.1.2 Maternal mental health problems and substance misuse

#### *Association with child maltreatment*

Maternal mental health problems and substance misuse are key risk factors for child maltreatment.[10,11] In particular, there is evidence that experiencing mental health conditions or substance use problems can adversely affect women's capacity to parent. For example, these healthcare needs have been shown to impair women's ability to recognise or respond to their child's needs, disrupt bonding between mother and infant, affect child development, and lead to reduced parental vigilance, making accidents more likely.[17–19] Subsequently, women experiencing these healthcare needs are at an increased risk of having a child placed into care by the state.[10,11]

#### *Prevalence among children with children's social care involvement*

Each of England's 152 local authorities have powers and duties to provide children's social care services to safeguard children and to promote their health and wellbeing under the Children Act 1989.[20] This includes powers to apply to the family court for an order to receive a child into care, where the child is suffering or at risk of suffering significant harm. While information about the prevalence of mental health problems and substance misuse among parents whose children enter care is unavailable,[21] the Department for Education in England publish statistics each year describing some characteristics among parents of children referred to children's social care services. In year ending March 2020, parents using drugs was a factor in around 11% of assessments, and parental alcohol use was a factor in 11%.[22] Parental mental health problems were a factor in 23%, though domestic violence remained the most prevalent factor in assessments, recorded in 26% of assessments. These statistics are not available disaggregated by parent gender (i.e., mother/father), nor by psychiatric disorder or substance type. The most recent Association of Directors of Children' Services (ADCS) 'Safeguarding Pressures' report asked all English local authorities whether parental factors including substance misuse, mental health problems or domestic violence had an impact on early help or safeguarding activity, with 45 of the 59 responding local authorities saying they had moderate or high impact.[23] Parental mental health problems in particular, as well as domestic violence, were cited by local authorities as one

of the most important drivers of increased activity in children social care services in recent years.

### *Prevalence among children in England*

More generally, evidence suggests that maternal mental health problems and substance misuse are common and increasing in the UK, though England-specific information is often lacking. Using Clinical Practice Research Datalink (CPRD) data, which are electronic general practitioner (GP) records on approximately 10% of the UK population, Abel et al estimated that 23% of children in the UK are exposed to maternal mental illness at any one time and up to 53% of children are exposed up to age 16 years.[24] The period prevalence of being exposed to maternal mental illness among children aged 0-16 years increased from 22.2% in 2005-2007 to 25.1% in 2015-2017, though this may be due, at least in part, to improvements in diagnosis and clinical record keeping over time. Incidence of first exposure to maternal mental illness was highest at 0-3 months old (26.7 per 100 person-years compared to 2.6 per 100 person-years at 16 years old). Few children had mothers with GP records of mental health problems related to alcohol misuse (0.24%) and substance misuse (0.25%). However, this study does not reveal the true extent of potential harms caused by exposure to parental alcohol and substance misuse. The prevalence of increased risk alcohol use (>14 units or 112 g of ethanol a week) among mothers was 18% in the Millennium Cohort Study (by age 14) and 15.2% in the Avon Longitudinal Study of Parent and Children (by age 11-12,).[25] In 2003, the UK Advisory Council on the Misuse of Drugs released the Hidden Harms report, which estimated that between 2-3% of children under the age of 16 years in England and Wales had a parent with a drug-use problem using data on adults presenting to drug treatment services between 1996-2000.[26] More recently, the Children's Commissioner for England estimated that 4% of children aged 0-17 years in 2019-2020 were living with a parent with problematic alcohol or drug use.[27] Given the strong association between maternal mental health problems and substance misuse and child maltreatment,[10,11] these increases support the ADCS safeguarding pressures report finding that parental mental health problems and substance misuse have contributed to increased activity in children's social care in recent years.[23]

### 1.1.3 An overview of child entry into care in England

*Risk of entry into care over childhood*

Approximately 3.3% of children born in England in 1992 to 1994 entered out-of-home care at least once before their 18th birthday (Figure 1.2), though more recent evidence suggests this number has since increased.[28,29]

**Figure 1.2: Cumulative incidence of child entry into out-of-home care in several settings among children in a given birth cohort. Year(s) of entry to the birth cohort is given in parentheses.**

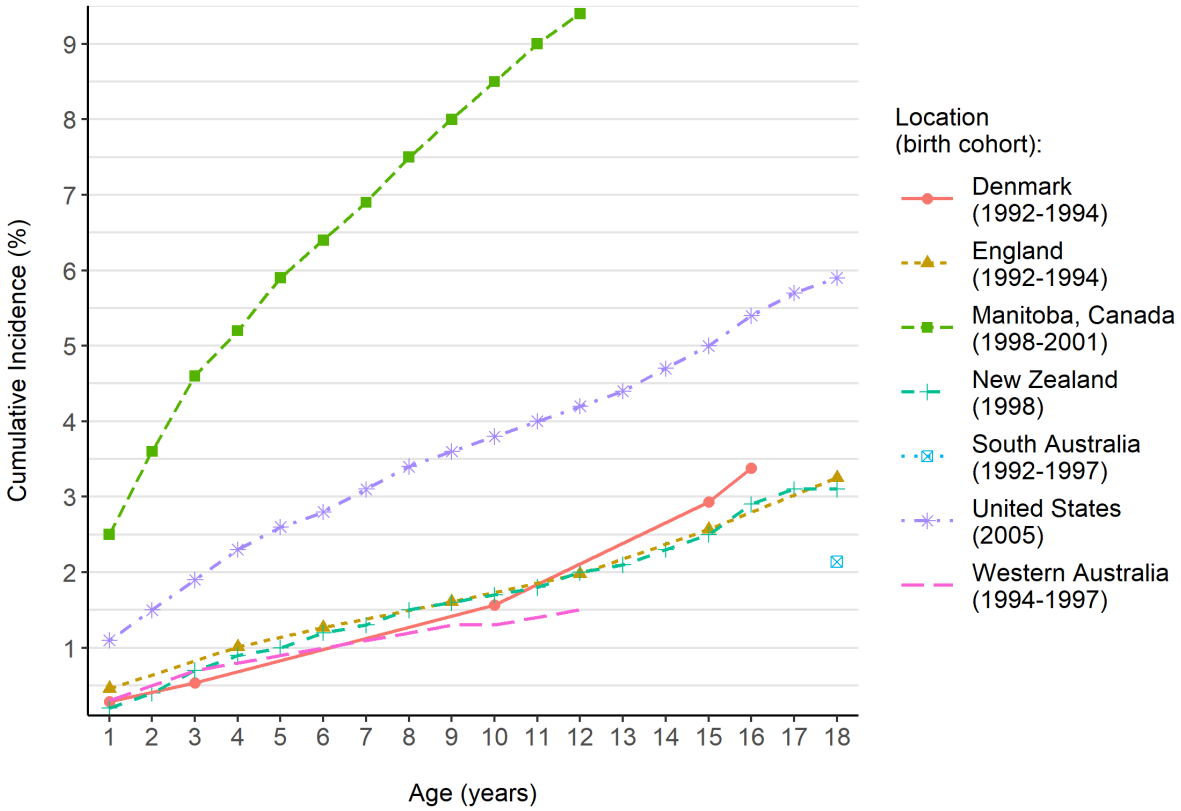
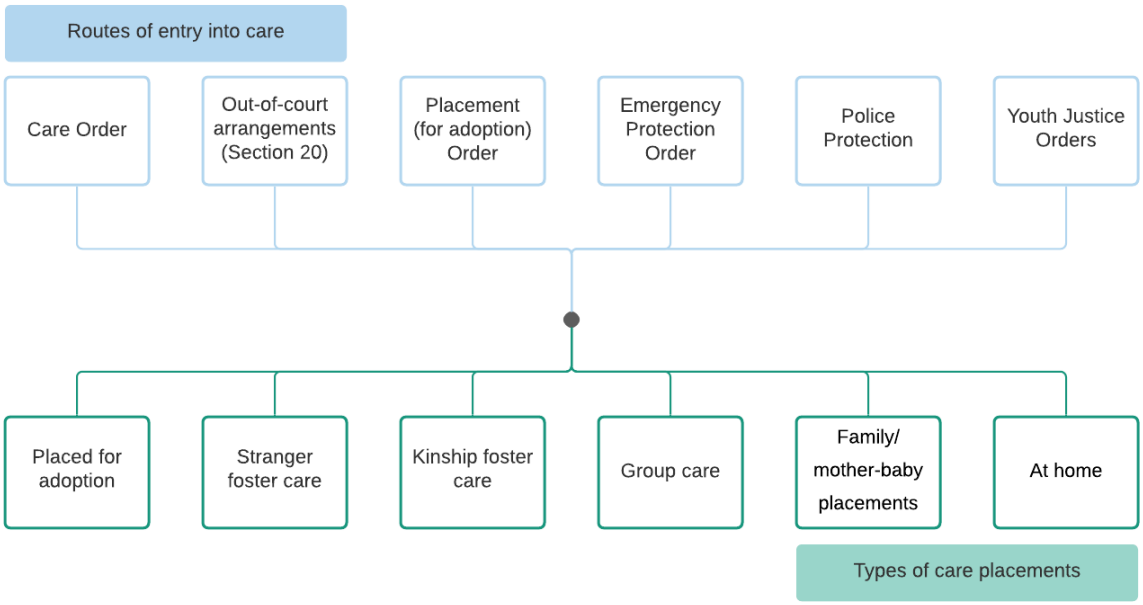



Figure 1.2 is based on data sourced from seven published studies and shows that the cumulative incidence of entry into care over childhood in England is similar to a number of other settings including Denmark, Western Australia, South Australia and New Zealand, but is far lower than the United States (5.9% by age 18) and Manitoba, Canada (9.4% by age 12). [30–34]

*Routes into care*

There are several legal routes under which children can enter care in England (Figure 1.3).

**Figure 1.3: Legal routes of entry into care and types of care placements**




Around 35% of children enter care via the family court under a care order. Care orders are the most common court orders made during public family law proceedings concerning placement of a child into state care, also known as care proceedings.[2] Pursuant to Section 31 of the Children Act 1989, on the application of a local authority, a judge may only make a care order if "*the child is suffering, or is likely to suffer, significant harm and that harm, or likelihood of harm, is attributable to either the care given to the child or the child being beyond parental control*".[20] This is commonly referred to as the 'threshold criteria' and, when met, enables the local authority to take on parental responsibility for the child, to care for and accommodate the child, and to curtail parental responsibility of the birth parents or other carers. Other court orders that can be made during care proceedings, subject to meeting the threshold criteria, include emergency protection orders (urgent orders to place a child into care for up to eight days) and placement orders (to place a child for adoption with prospective adopters). A further 50% of children who enter care do so via out-of-court arrangements under section 20 of

the Children Act, also known as s20 arrangements.[2] These include, firstly, discretionary arrangements between the local authority and the parents (where alive and locatable) and can only be made where those with parental responsibility do not object.[20] Additionally, local authorities must provide accommodation to children under s20 arrangements where the child appears to require "*accommodation as a result of (a) there being no person who has parental responsibility for [the child]; (b) [their] being lost of having been abandoned; or (c) the person who has been caring for [them] being prevented (whether or not permanently, and for whatever reason) from providing [them] with suitable accommodation or care*". The remainder of children in care enter under police protection powers (which last for up to 72 hours) or youth justice orders (such as being remanded into care).[2]

### *Placement types*

Similarly, there are several types of care placements (Figure 1.3). At any one time, around 57% of children in care are in stranger foster care placements, while 14% are living with kinship foster carers (i.e., friends or family) and 3% are living with prospective adopters.[2] Around 7% of children in care remain with their parents, either at home or in family/mother-baby placements in specialist hospital wards or with foster carers. Others (15%) are placed in group care settings such as children's homes, secure units, semi-independent placements, and other residential settings. The remaining 3% live independently in the community (i.e., children 16 years and older). Most children are in care only for a short period, with a median length of stay of 4 months and a median of 2 placements between birth to 18 years old.[35]

### *Characteristics of children who enter care*

Almost two-thirds of children entering care each year have 'abuse and neglect' recorded as their main reason for entry.[2] More children entering care each year are male (57%) than female and almost two-thirds are aged 5 years and over. Infants (under one year old) account for 20% of entries to care each year, over 70% of whom enter within 4 weeks of birth.[36] Though an estimated 3.3% of children in England will enter care before their 18$^{th}$ birthday, there is evidence that the cumulative incidence of entry into care over childhood is much higher among Black or Black British children (4.5% before age 9) and

children of mixed ethnic background (4.2% before age 9).[28] Similarly, Black and mixed heritage children make up 10% and 9% of entries to care each year despite accounting for just 4.7% and 5.0% of the English child population.[2,37] The association between ethnicity and risk of entry to care is also modified by deprivation.[38] For example, in the 10% most deprived English local authorities, Black and Black British children actually have lower rates of entry into care than white children.

## 1.2 Evidence on maternal mental health problems and substance misuse among children who enter care in England

### 1.2.1 Research using cohort studies and surveys

There is some quantitative evidence about maternal mental health problems and substance misuse from four evaluations of support services for women who have had children placed into care.[39–42] These studies found that mental health problems and substance misuse were common among women who accessed these services, with between half and two-thirds of service users participating in the research reporting mental health issues and around one-third reporting problematic drug or alcohol use. However, these studies had several limitations which affect the generalisability of these findings. First, these services only operate in a small number of local authorities and therefore women included in these studies are unlikely to be representative of women across England who would be eligible. Second, not all women eligible for these services will engage with services and women perceived to be unlikely to engage may be rejected from services where demand outstrips capacity, leading to substantial selection bias. Selection bias may also be introduced if women who volunteered to participate in the research differed systematically from those who did not. Finally, these studies have very small sample sizes (ranging from 12 to 115 women) and used self-reported measures from women to capture mental health problems and substance misuse which may be affected by social desirability bias and therefore underreported.[43]

Researchers have also linked children's social care data for a single local authority to questionnaire data that collected information from women during an antenatal visit between 2007-2011; of the 11,332 children born to women in the survey, 1086 (9.6%) of children were 'in need' due to abuse or neglect and 84 (0.7%) entered local authority

care at some point before linkage occurred (August 2015).[44] Maternal mental illness was measured using the General Health Questionnaire screening tool (GHQ-28), rather than by clinical diagnosis, with higher scores indicating higher levels of distress. Scores were available for 83.6% of the cohort. Researchers also captured prenatal recreational drug use and prenatal binge drinking, measured using self-report, as drinking more than five units of alcohol on any occasion during pregnancy. In a multivariable model including other maternal characteristics, higher GHQ-28 scores (hazard ratio: 1.17, 95% Confidence Interval: 1.07 to 1.28) were associated with a higher instantaneous risk of having a child designated 'in need' due to abuse or neglect.[45] There was no evidence of an effect for prenatal binge drinking (0.89, 95% CI: 0.70 to 1.12) or prenatal recreational drug use (1.37, 95% CI: 0.94 to 2.00), though the trend in the confidence interval suggests that a study with more power may have detected a positive association between prenatal recreation drug use and having a child designated 'in need' due to abuse or neglect. The survey data were collected during the antenatal period and therefore the self-report measures about drug and alcohol use are likely affected by social desirability bias, leading to underreporting and therefore potentially an underestimate of the effect on having a child designated 'in need'.[43] In addition, there are issues of internal and external generalisability as there was no information on whether women who took part in the study systematically differed from women who did not and findings are based on data from a single local authority, collected over a relatively short period of time. This study also highlights the pitfalls of cohort and survey study designs for researching child entry into care events; despite over 10,000 children being included in the cohort, just 84 (0.7%) entered care over the study period. This was too few to produce precise estimates for any association between entry into care and maternal health characteristics.

### 1.2.2 Research using administrative family court data

Some researchers have used administrative family court data to explore mental health problems and substance misuse among women whose children are in care proceedings.[46,47] These data include structured fields describing adults and children involved in proceedings, hearing dates and legal orders made. However, information about mental health and substance misuse are often found in free-text fields such as written notes and letters. This requires manual review of court case files which is time intensive and

therefore only small numbers are typically included. One study, published in 2008, used a randomly-selected sample of 386 s31 applications (i.e., applications made to instigate care proceedings) made by 15 English local authorities in 2004.[47] Almost one-third of mothers in the 386 cases had recorded mental health problems (31.5%), 38.6% had recorded drug abuse and 25.3% had recorded alcohol abuse. Domestic violence was also common (52.4%). Three-quarters of women (72.6%) had a record of refusing support from or refusing to cooperate with healthcare services, including for substance misuse treatment.

Other researchers have utilised family court case management data collected by the Children and Family Court Advisory and Support Service (Cafcass) who capture data on all care proceedings in England.[1] Much of this work focusses on women involved in two or more sets of care proceedings (so called 'recurrent mothers'). An estimated one in four women involved in an initial set of care proceedings will return to court for a subsequent set of care proceedings within seven years.[46] Women who returned typically do so quickly (60% within one year), leaving them with little time to make and demonstrate a change to their capacity to parent. Most (73%) return with an infant (under 12 months old). The true prevalence of recurrence among women is likely to be even higher, as family court data will not capture women who have children placed into care under s20 arrangements, and not all women will have a subsequent pregnancy (i.e., the number at risk of returning is smaller than currently counted). One study involved a case file analysis of a random sample of 354 recurrent mothers in England. More than half of these mothers had a record of mental health problems or substance misuse at both their first and second recorded sets of proceedings, often alongside other issues such as domestic violence and housing instability.[46] Though, again, this is likely to be an underestimate as Cafcass may not capture all instance of mental health problems or substance misuse among mothers, particularly if they are unknown to them. Many recurrent mothers experienced multiple childhood adversities, particularly childhood abuse and neglect, and 40% entered local authority care during their own childhood. It is well understood that childhood adversity is linked to substance misuse, risky sexual behaviour, domestic violence and abuse, self-harm, and poorer health outcomes later in life, highlighting the pathways for the intergenerational continuity of child maltreatment.[35,36] Due to the lack of clinical diagnosis data, mental health problems and substance misuse in this

research were presented in aggregate without further breakdown by diagnosis or substance type.[46]

### 1.2.3 Research using administrative health data

Researchers have also used administrative health data on women receiving specialist psychiatric perinatal healthcare services to explore, among women with severe perinatal mental health conditions, the differences between those who have children placed into care and those who do not.[48,49] Two studies published in 2003 described child protection outcomes following women's discharge from mother-baby units, which are specialist inpatient units for women experiencing severe mental health problems in late pregnancy or the perinatal period. The first study involved 527 women admitted to several mother-baby units in the UK between 1996-2001 who had a psychotic disorder diagnosis or psychotic symptoms, with 30% discharged under local authority supervision or with their infant placed local authority care.[48] Women who had a child under local authority supervision or in care on discharge were more likely to be Black, to have no partner, to have a diagnosis of schizophrenia, to be under a mental health section, and to have generally poor relationships with others. The second study involved 61 women referred by children's social care to a South London mother-baby unit for a parenting assessment between 1993-1998, with 59% already in care proceedings before admission and 56% having their infant placed in care on discharge from the unit.[49] Again, there are important limitations with these studies. First, they may underestimate child entries to care, as entries occurring after women's discharge from the mother-baby unit were not captured in the data available. Second, the samples are unlikely to be representative of women requiring mother-baby unit admission in England, as not all women requiring perinatal mental health inpatient care in England have access to mother-baby units, with many treated in general psychiatric units instead.[50] Further, many infants are taken into care within a week of birth, leaving many women with mental health problems in the perinatal period ineligible for mother-baby unit admission, unless it can be agreed for the infant to be transferred to the mother-baby unit.[36,51]

More recently, a 2019 study used national administrative data on delivery hospitalisations in England, finding that women with a birth resulting in neonatal abstinence syndrome (indicating prenatal drug use) were 100 times more likely to have

their child placed into care at discharge from hospital than other women giving birth.[52] Among the 13,577 women with a child with neonatal abstinence syndrome, 9.7% had their child discharged to care at the end of the birth admission compared to 0.1% among a cohort of 4,205,675 matched controls who gave birth to a child without neonatal abstinence syndrome. However, the rate of entry to care within seven days of birth in England ranged from 0.3-0.4% of live births between 2006-2012, compared with 0.1% among controls in the study, suggesting entry to care following birth is severely underestimated in hospital records.[36]

Finally, a 2012 case-control study used CPRD data on mothers and their children from general practices in the UK to identify risk factors for entry to care.[53] Unfortunately, the methodological quality of this study was very poor, with several biases likely affecting study findings. First, the study modelled over 50 child and family risk-factors for entry into care in multivariable regression models, despite many risk-factors having very small cell counts (< 10 among cases or controls), leading to sparse data bias as indicated by the several extremely large confidence intervals reported in Table 2 and Table 3.[54] There were 370 children in the data recorded as entering care, however just 147 (40%) were included as cases in the analysis after exclusions of children with missing maternal information and socioeconomic data, leading to probable selection bias. Similarly, just 538 (36%) of the original control group were included as controls after excluding those with missing data. In addition, validation efforts to confirm child entry to care status suggested that misclassification of the exposure could have occurred in up to 33% of cases, indicating significant misclassification bias.

### 1.2.4 Summary

In England, children's social care and family courts do not routinely capture parental healthcare need or service use, nor do health services routinely collect information on children's social care outcomes, including entry to care, among patients who are parents. This leaves few options for researchers wishing to generate large-scale evidence on the healthcare needs of women whose children enter care.[37] Traditional prospective cohort studies and surveys, which typically include only a small sample of the population of interest, are not well suited for research into the associations between parental health service use and child entry into care as relatively few (~3.3%) children in England ever

enter care, leading to studies that are underpowered to detect these associations.[28,55] In addition, families at higher risk of being subject to child protection investigations are likely hard to engage and retain in research that relies upon self-reported measures.[56,57] For example, in the linkage of the Avon Longitudinal Study of Parents and Children (ALSPAC) cohort study to the National Pupil Database (educational data for England with indicators from children's social care), 80% of the 137 children in the linked ALSPAC cohort identified as having ever entered care were lost to follow up by age 12.[55] These types of studies are therefore unlikely to be representative to the population of interest. Prospective cohort studies and surveys in the literature also relied on self-reported information about mental health problems and substance use which likely suffers from social desirability bias and may underestimate associations.

Existing studies solely relying on healthcare data only highlight that entry to care is unlikely to be well captured in English healthcare records,[52] particularly if entry occurs a long time after healthcare use or is not relevant to clinical treatment. As with prospective cohort studies and surveys, any findings using healthcare data only would likely have poor generalisability to the general population of women in England who have children placed into care. Similarly, studies using solely family court or children's social care data will typically underestimate maternal healthcare needs,[21,58] particularly those occurring after the child entered care. In these studies, type of mental health disorders and substance misuse are rarely disaggregated, ignoring heterogeneity driven by differing mental health profiles.[64] It is also not possible to construct a comparison cohort using these types of data for women who do not have children placed into care, for example, to examine maternal health-related risk factors for child entry into care.

The statistical quality of the quantitative studies mentioned in this section is generally poor. For example, several of the studies fall prey to the 'Table 2 fallacy' where multiple explanatory measures are included in multivariable regression models, without identifying a primary exposure, and the model-estimated coefficients for these measures (e.g., such as odds ratios and hazard ratios) are interpreted as being mutually-adjusted.[59] As different measures will have different sets of potential confounders, it is unlikely that all will be accounted for in a single model.

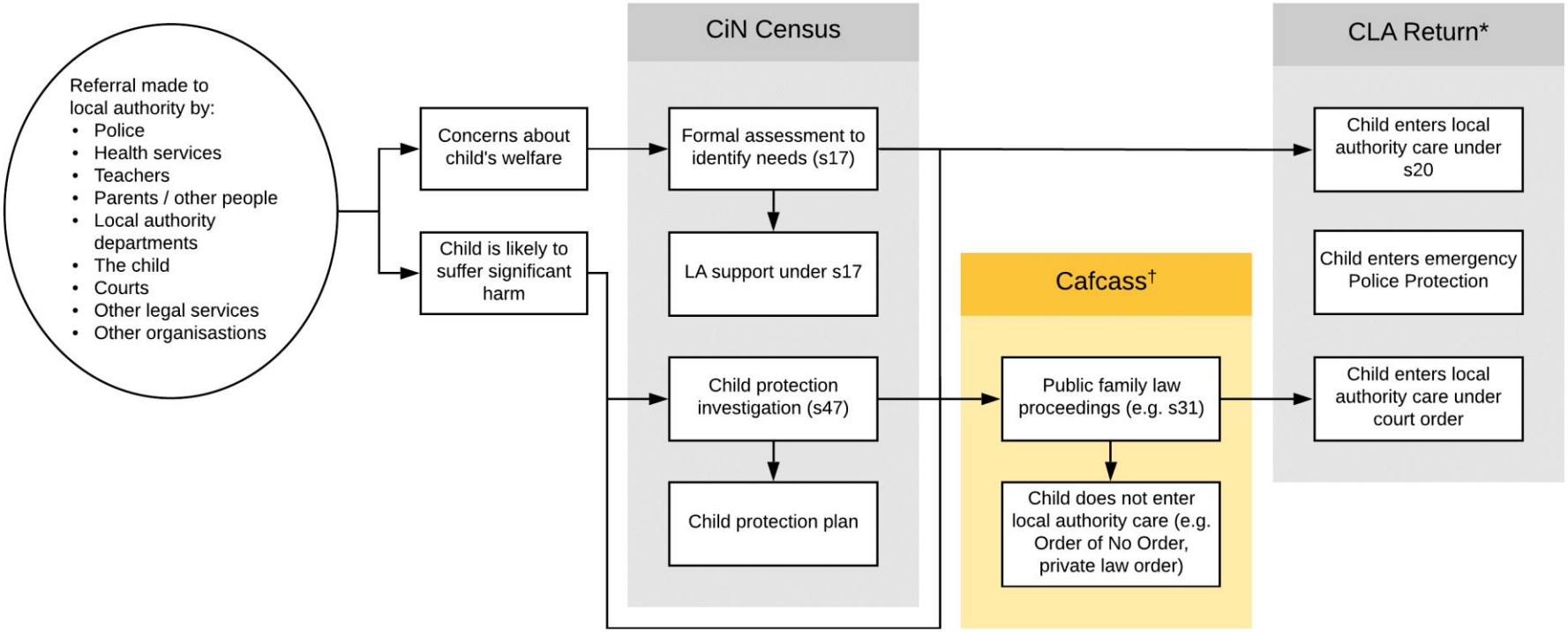
Finally, all of the studies discussed above focussed on the associations between prior maternal mental health and substance use and subsequent child protection outcomes.

None looked at risk of long-term health outcomes among women who have had children placed into care, including maternal mortality. Birth mothers remain an important person in the lives of many children in care,[60] yet there is growing evidence that women experience worsening health following child entry to care and have high rates of mortality,[61–67] leaving many children in care with fewer opportunities for engagement with their birth mother, with associated consequences for their wellbeing.

### 1.2.5 Opportunities for administrative data linkages in England

The establishment of pathways in other countries to link routinely collected health and child protection data has led to an abundance of findings on the interrelationship between maternal health and child protective services involvement in several settings across Europe, North America, and Australia.[64,68–73] In South Australia, for example, population-level findings from linkages have even been operationalised to guide the redesign of early support services for children at risk of maltreatment and their families.[73] In England, large-scale linkages between administrative health records and data on child protection outcomes for research are underrealised, despite calls for better evidence about the large numbers of women with mental health problems and substance misuse coming into contact with children's social care and the family courts.[21,74] There are three nationwide administrative data sets that capture information on children who enter care in England: 1) the CiN (Children in Need) census, 2) the CLA (Children Looked After) return, and 3) the Cafcass case management database (Figure 1.4).[75–77]

**Figure 1.4: A summary of how the three different national datasets capture children who come into initial contact with children's services. [Source: Bedston and Pearson et al, 2020. Data Resource: Children and Family Court Advisory and Support Service (Cafcass)]**




*All children in the care of a local authority are, by definition, also children in need (section 17, Children Act 1989). Therefore, these children are in both the CiN Census and CLA return.

†The Cafcass data contains information on all family members relevant to the case, not just children.

CiN = Children in Need; CLA = Children Looked After.

Both the CiN census and the CLA return are collated by the Department for Education (DfE) based on annual submissions from all English local authorities. CiN captures data on all children formally assessed or subject to a child protection investigation, also recording whether they enter care, while CLA captures data on all children who enter care in England. As DfE do not collect person identifiers, nor any data at all about family members, of children in the CiN and CLA databases, these data cannot be linked to parental health records.[78] However, previous research has aggregated CiN and CLA data by year and local authority and combined it with publicly available data about local authorities to investigate the association between local authority characteristics (e.g.,such as rates of relative deprivation) and rates of children's social care activity (i.e., an ecological study).[79–81] None of these studies included local authority-level measures of parental health care need.

The Cafcass data set, on the other hand, captures all children and adults involved in care proceedings in England, following a s31 application.[75] Unlike the CLA return, Cafcass captures children involved in s31 applications but who, instead of being placed into care, are placed by the court with extended family (such as grandparents) under private law orders (Figure 1.4). Although just over 50% of children involved in proceedings will receive a legal order placing them into local authority care, a 2008 study found that the majority of children in proceedings (74.4%) were already in local authority care when the section 31 application was made, indicating that the majority of children in care proceedings enter care at some point.[47] The Cafcass data includes person identifiers for adults and children such as names, date of birth, and address, as well as recording the relationships between individuals in the database. Therefore, linkages are possible between English healthcare data and Cafcass data on parents or children involved in care proceedings. Furthermore, these types of linkages have already been realised in Wales, within the Secure Anonymised Information Linkage (SAIL) databank, between Cafcass Cymru (Cafcass in Wales) and National Welsh administrative health data sets.[82–84] The Cafcass data are described in greater detail in Chapter 4.

## 1.3 Thesis rationale

Existing studies support the notion that many women whose children enter care in England have considerable health needs related to mental illness or substance misuse.

Therefore, a key policy question is whether improved access to healthcare for women with children, or who are pregnant, who experience mental health problems or substance misuse could mitigate some of the risks posed by these conditions for child safety and wellbeing. Not only could this lead to a reduction in demand on children's social care and family courts, but better access to healthcare for this group would also benefit the health and wellbeing of women and their children. First, quantitative evidence is needed on the scale of the contribution of maternal mental health problems and substance misuse to the increased rates of child entry into care in England to inform policymakers and to motivate policies enabling accelerated access to mental health and substance misuse services for parents to reduce the number of children requiring care placements. Second, in absence of robust empirical evidence regarding prevalence of, or the detail on types of mental health and substance misuse service most needed (specific to this population), policy-makers and commissioners may be limited in their ability to commission and allocate services to support to this population, impeding their ability to prevent some entries into care.

Better evidence on the mental health conditions and substances used by women with children placed into care would also inform secondary preventive strategies to improve responses to maternal mental health problems and substance misuse within children's social care and the family justice system by providing better understanding of the health burdens experienced by this group. Indeed, this would help to inform which expertise is needed within multidisciplinary teams or which specialist service referral pathways should be strengthen within children's social care. However, current evidence from England, as described in section 1.2, provides little insight.

Adequate support for birth mothers following placement of a child into care is also important. The grief and stigma experienced by women, as well as material losses such as child-related welfare support, may exacerbate existing health need or trigger new problems, and may make them more vulnerable to future unplanned pregnancies.[48–50] In absence of tertiary preventive strategies to reduce recurrent losses to care, women with children placed into care who later have a further pregnancy are likely have that child placed into care also.[48] As highlighted in section 1.3.2, previous studies have shown that a large number of women involved in care proceedings in England later return to court, yet little is known about why some women return to court while others

do not.[46] Given the limited provision of post-proceeding support across England, better knowledge about women's healthcare needs before, during and after proceedings may identify groups at higher risk of returning to court and inform better targeting of these limited services to those who may benefit the most.

There is also evidence from other settings that women with children placed into care have higher mortality rates.[63–65] As people who experience mental health problems and substance misuse already have higher mortality rates compared to the general population,[85] it is important to understand whether there is a 'double jeopardy' for women who experience these conditions and have children placed into care as higher mortality rates could indicate higher levels of unmet healthcare need among this population.

## 1.4 Thesis aims and objectives

The overarching aim of this thesis was to generate evidence on the interrelationship between mental health and substance misuse service utilisation and family court trajectories for women in England, to be used by practitioners, services, commissioners and policymakers to inform improved responses to women's health needs in the context of child protection. To achieve this, I used two data sources: first, area-level information on maternal hospitalisations related to mental health and substance use and child entries into care, and second, a new linkage between Cafcass and mental health and substance misuse from the South London and Maudsley NHS Foundation Trust (SLaM) for women with children in care proceedings in the SLaM catchment (Croydon, Lambeth, Lewisham and Southwark) between April 2007 and March 2019. SLaM provide mental health and substance misuse services to a population of more than 1.3 million.[84]

I had five objectives:

**Objective 1.** To determine whether aggregate data on maternal health and child entry into care can be used to examine the association between maternal mental health and substance misuse and infant entry into care in England.

**Objective 2.** To explore the existing literature examining maternal mental health and substance misuse among children who enter care using linked administrative child protection and health data sets.

**Objective 3.** To assess the accuracy of a new linkage between family court data and mental health service records for women involved in care proceedings in South London, 2007-2019.

**Objective 4.** To characterise the mental health and substance misuse needs and healthcare use among women in care proceedings who link to a mental health or substance misuse service user record. This objective has two sub-objectives. To describe:

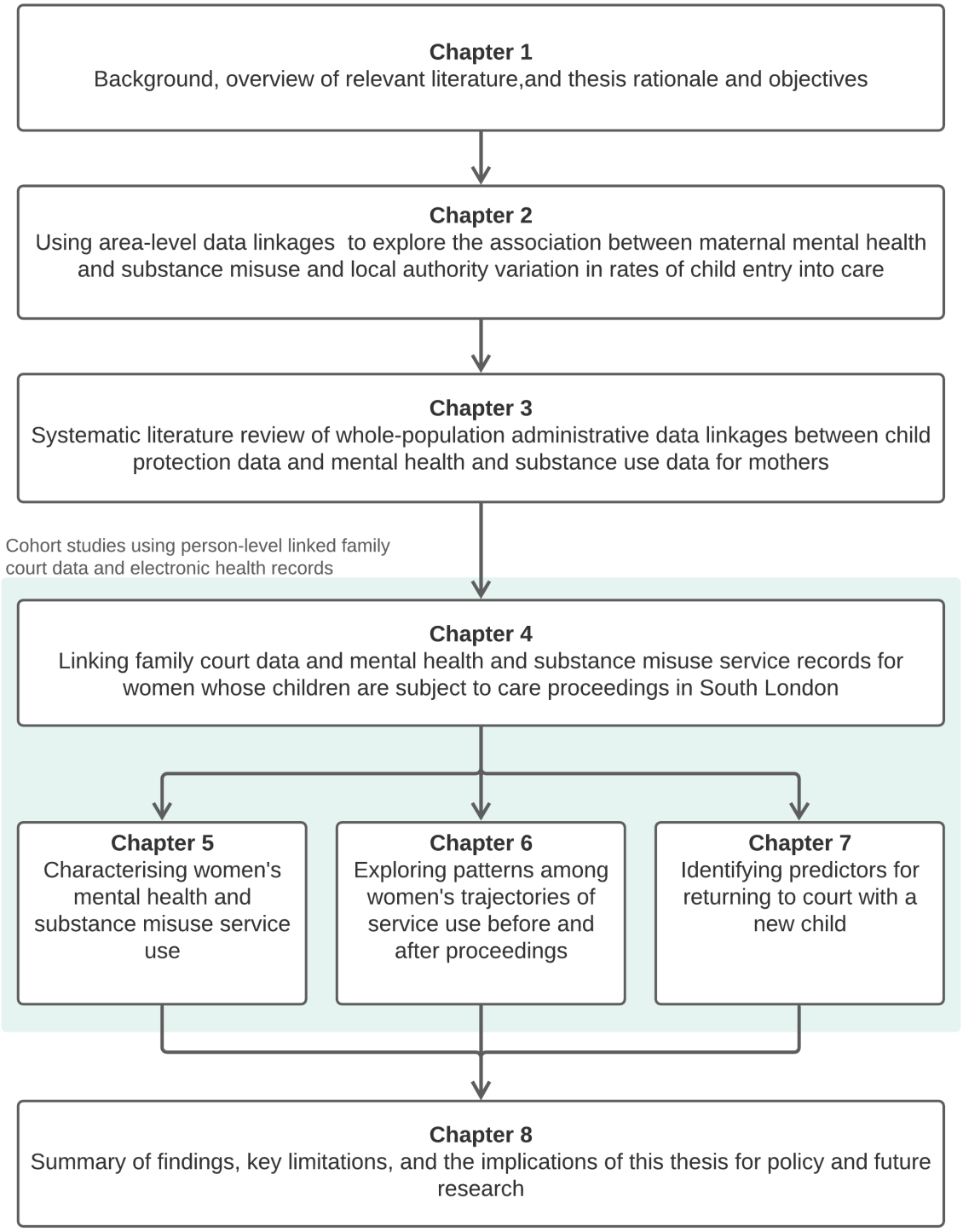
a. Type, intensity and severity of mental health and substance misuse service use in terms of diagnoses, service contacts (referrals, inpatient admissions, and outpatient attendances), and mortality; and
b. Longitudinal trajectories of mental health and substance misuse service use before and after onset of proceedings, including referrals, inpatient admissions, and outpatient attendances, in aggregate and at the person level .

**Objective 5.** To identify predictors for returning to court for a further set of care proceedings involving a subsequent infant, that can be measured in the linked family court and mental health service data.

## 1.5 Thesis structure

This thesis is comprised of eight chapters (Figure 1.5).

**Figure 1.5: Thesis chapter structure**



In **Chapter 2**, I addressed objective 1 via an ecological study using local authority-level aggregated measures derived from person-level administrative data sets on child entries to care and maternal hospitalisations prior to birth, between 2006/2007 to 2013/2014. Using these data, I performed linear mixed-effects modelling to examine the relationship between local authority prevalence of maternal hospitalisation related to mental health or substance use before birth (among women giving birth) and rate of infants entering care prior to birth and infant entry to care, over eight years. This study enabled me to explore the importance of local authority prevalence of maternal health need related to mental health and substance misuse before birth in explaining the large variation in rates of infant entry into care across England.

In **Chapter 3**, I addressed objective 2 via a systematic literature review of studies that used linkages between administrative healthcare data on mothers and official child protection records to identify mental health problems or substance misuse among women whose children who enter care.

In **Chapter 4**, I describe the key data sources used in this study – data from SLaM and Cafcass - and their linkage to create a new data resource providing longitudinal coverage of mental health and substance use service use for over 3000 women with children in care proceedings. I also evaluated this linkage via manual review, to understand its quality, and regression modelling, to identify characteristics associated with linkage status.

In **Chapter 5**, I used the new linked data to provide evidence on the types of mental health services used, clinical diagnoses, and severity and intensity of mental health need experienced among women with children in care proceedings in the SLaM catchment who linked to a SLaM patient record. I performed a matched control cohort study, with controls sampled from all women accessing SLaM service between 16-55 years old. I also described differences in mortality rates between women accessing SLaM services who were and were not involved in care proceedings.

In **Chapter 6,** I described trends in SLaM service use, including referrals, inpatient care and outpatient attendance, among women with children in care proceedings in the SLaM catchment who linked to a SLaM patient record. I focussed on the two years before and the one year after onset of women's first recorded set of care proceedings to identify

changes in service use before, during and after proceedings. I also applied Latent Trajectory Analysis to identify common longitudinal patterns in women's inpatient and outpatient activity over this period.

In **Chapter 7,** I described the incidence of returning to court with a subsequent infant (born following women's first recorded set of proceedings) among women with children in care proceedings in the SLaM catchment who were known to SLaM before entering care proceedings. I then described differences between women who did and did not return with and infant and applied predictive modelling to identify key predictors of returning to court.

In **Chapter 8**, I discussed the main findings of this thesis and their implications for policy and practice, as well as highlighting areas requiring further research.

# Chapter 2: Using an ecological approach to explore the relationship between maternal adversity and entry to care in England

**Chapter overview**

In this chapter, I performed an ecological study which used aggregate data from health and children's social care, as well as publicly available data describing local authority populations, to examine the association between maternal mental illness and substance misuse before birth and local authority rates of infant entries into care. This work addressed objective 1 of the thesis:

*To determine whether aggregate data on maternal health and child entry into care can be used to examine the association between maternal mental health and substance misuse and infant entry into care in England.*

A paper based on this chapter was published in the BMJ Open in August 2020.

Pearson RJ, Jay MA, Wijlaars LPMM, et al. Association between health indicators of maternal adversity and the rate of infant entry to local authority care in England: a longitudinal ecological study. (2020) BMJ Open;10:e036564. doi: 10.1136/bmjopen-2019-036564

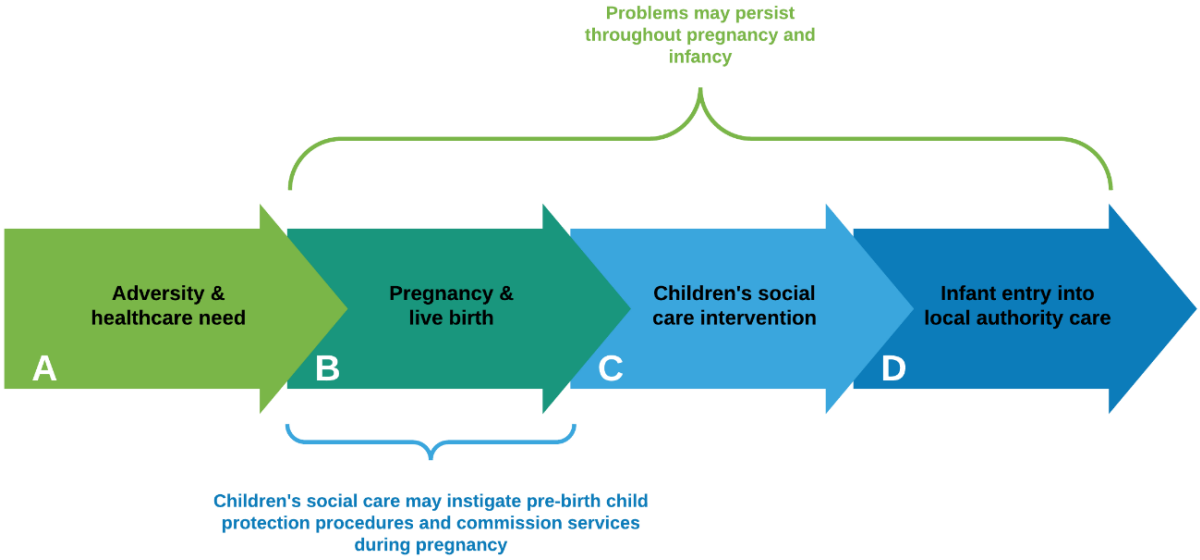
## 2.1 Background

Longitudinal administrative data from hospital services (Hospital Episode Statistics) and children's social care (Children Looked After return) have whole-population coverage in England and are widely available over many years.[77,86] Aggregating and linking these data by local authority (LA) and year does not require the permissions that a person-level linkage would, therefore enabling more rapid analyses via longitudinal ecological studies. However, interpretation of any findings from ecological studies are limited by ecological fallacy and restricted to making inference at the aggregate level only (i.e., local authorities with a high prevalence of adults who smoke have high incidence of lung cancers). Conversely, linking longitudinal data at the person-level enables inference about individuals (i.e., adults who smoke are more likely to be diagnosed with lung cancers).

However, person-level linkages require permissions and secure data settings that often take years to obtain and establish.[87]

In absence of data linkages, the relationship between maternal mental health and substance misuse problems and child entry into care can be studied using an ecological approach, combining data by local authority (LA). Here I have grouped mental health and substance misuse problems with indicators for self-harm and exposure to violence, which are likely to be comorbid conditions, and refer to them collectively as maternal adversity.[88] This relationship is likely to be strongest during infancy (under one year old), as infants are entirely dependent on their caregivers and are, therefore, particularly vulnerable in cases where capacity to parent is compromised (Figure 2.1). Furthermore, one in five children who enter care in England are infants and, since 2010, the rate of infant entry into care in has increased by 20%.[2] Other countries, including Scotland, the US, Aotearoa New Zealand, and parts of Australia, are facing similar increases in infant entry to care.[4,89–91] There is also marked regional variation in rates of entry within each of these settings,[36,89–93] with limited evidence on what drives geographical differences.[94,95] Though a number of studies have attempted to identify key drivers of variation in the LA rates of child entry into care in England, none have considered indicators for parental health.[38,79,81,96]

**Figure 2.1: A (simplified) theoretical pathway from adversity-related healthcare need before birth to infant entry into care**




***(A)*** *Substance misuse, DVA, and mental health problems not only affect day-to-day functioning but can also lead to serious and complex healthcare need.* ***(B)*** *These forms of adversity can also affect capacity to parent and may result in harm to the unborn child or infant. In addition, pregnancy, birth and caring for an infant place additional stress on parents which can exacerbate experiences of adversity.* ***(C)*** *Where children are at significant risk of harm, children's social care have the power to apply for a court order to* ***(D)*** *receive the child into care or may otherwise place a child into care where to do so is in the child's best interests and the parents do not object.*

## 2.2 Methods and materials

### 2.2.1 Study design

I used yearly (Apr-Mar) aggregate measures between 2006/07 and 2013/14 for 131 English LAs (i.e., 88% of LAs), derived from several data sources. I excluded 20 LAs from the analysis for having too few live births or poor data quality in at least one measure in one or more years. As all data used were de-identified or already publicly available and anonymised this analysis did not require approval by the UCL research ethics committee or NHS Research Ethics Committee.

### 2.2.2 Study outcome

The study outcome was the yearly LA incidence rate of children first entering care during infancy, per 10,000 infants resident in the LA. The rate numerator was derived using the Department of Education's Children Looked After (CLA) data set, while the denominator

was defined using Office for National Statistics (ONS) mid-year population estimates.[97] CLA is a statutory data collection collated by the Department for Education and contains record-level information on all children who enter care in England, based on annual submissions from each LA. CLA includes information on child demographics (e.g., age, sex, ethnicity etc.) and episodes in care (e.g., episode dates, legal status, placement type etc.).[77] I used a longitudinal extract of CLA containing episode-in-care-level information for all children who first entered care between 1st April 2005 and 31st March 2014 while under one year old, excluding infants who first entered care under respite arrangements (i.e., an agreed series of short-term breaks, typically provided for children with complex healthcare needs). CLA does not contain any parent-level data as DfE do not routinely collect information on the parents of children who enter care. For further details on the CLA extract, see Figure A 1.1.

### 2.2.3 Explanatory measures

Entry into care is driven by a complex ecological framework of risk factors relating to children and their families, the local community, service thresholds and capacity, and wider society.[10,11,98] As I am interested in isolating the relationship between LA-specific prevalence of maternal adversity-related healthcare need before birth on LA-specific rate of infant entry to care, I have accounted for a range of other LA-level risk factors for entry into care that are likely to confound the association between maternal adversity and infant entry into care (Table 2.1). I chose these measures based upon evidence, [10,11,98] data availability and quality, and interpretability.

#### *Longitudinal patient-level data on hospital admissions*

I used the Hospital Episode Statistics Admitted Patient Care (HES APC) database, provided by NHS Digital, to calculate the main exposure (the proportion of singleton live births with maternal history of adversity-related hospital admission) and other maternal and child characteristics near to birth (Table 2.1). HES APC contains information on admissions to hospital, including patient demographics and diagnosis codes following the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10).[99] Using HES APC, I created an extract that included all recorded

singleton live births between 1st April 2006 and 31st March 2014. For each birth, I derived a look-back period that included all of the mother's inpatient episodes within the three years prior to delivery to maximise identification of risk-factors prior to birth. I excluded births where all recorded maternal areas of residence over the look-back period, identified via the lower-layer super output area (LSOA) codes were non-English or missing, as an English LSOA was required to derive maternal deprivation status (via the 2010 English Index of Multiple Deprivation).[100] Using Harron et al's longitudinal linkage of HES APC for mothers and babies in England,[101] I had access to the child's HES APC record for 96% of live births in the cohort. For further details´ on this HES APC extract, see Figure A 2.2. I used this extract to define my exposure of interest — the proportion of live births with maternal history of adversity-related hospital admission (ARA) — as any hospital admission related to substance misuse, exposure to violence, or mental health problems during the look-back period using mutually non-exclusive ICD-10 code lists (for ICD-10 code lists, see Table A 2.2).[102–105] These codes have previously been validated among other populations.[106–109] I also derived four further explanatory measures: 1) the proportion of live births where maternal age was under 20 years old, 2) the proportion of live births where maternal LSOA history was within 10% most deprived LSOAs in England; 3) the proportion of live births with low birth weight, and 4) the proportion of live births where the child was diagnosed with a complex chronic condition in early childhood (Table 2.1).[110]

### *Publicly available data*

I obtained all other yearly LA figures for risk factors from publicly available data. I used data from the 2011 Census to derive the percentage of dependent child households with a lone parent (i.e., single-parent households) and used LA-specific rates of violent crime published by Public Health England (PHE) as a proxy measure for prevalence of LA violence.[37,111] I also included LA population size in the set of explanatory measures, from the ONS mid-year population estimates, to account for differences between LAs with larger and smaller resident populations.[97]

### 2.2.4 Longitudinal modelling

I analysed the relationship over time between the LA-specific, yearly rate of infant entry into care and LA-specific, yearly percentage of singleton live-births with a maternal history of ARA, using linear mixed-effect models with restricted maximum likelihood estimation (For histograms of the outcome, see Figure A 2.3). The LA-specific percentage of live births with maternal history of adversity-related hospital admissions was modelled as a time-varying covariate between 2006/07 and 2013/14. The model coefficient for this covariate could be interpreted as the effect of an increase either within the same LA (within-LA effect) or between different LAs (between-LA effect), assuming these effects are equivalent, which may not be the case. Therefore, I allowed the between- and within- effects to differ from one another by replacing the original LA-specific variable with two variables: (1) the mean value over the study period, and (2) the difference from this mean for each yearly value. The coefficient for the first variable captures the between-LA effect and the coefficient for the second the within-LA effect.[112] I used Wald $\chi 2$ tests to test the null hypothesis that these two effects were equal. All other LA-level risk factors for entry into care were included in models as non-time varying variables using data from 2010/11 only (i.e., midpoint of study period) to improve model parsimony. I fitted five models: (1) a ('null') model with only financial year as the explanatory variable; (2) a model with financial year and both LA-specific mean and mean-centred maternal adversity-related hospital admissions prevalence among live births; (3) a model which included all explanatory measures (as listed in Table 1), including mean and mean-centred maternal adversity-related hospital admissions prevalence; (4) a model which included all explanatory measures and the original maternal adversity-related hospital admissions prevalence; and (5) model 4 with an interaction between financial year and maternal adversity-related hospital admissions prevalence. Models (1) to (4) included random-intercepts for LA and random-slopes for financial year. Model 5 included only random intercepts for LA as more complex random effects structures did not converge. The assumption of normality for the level-1 residuals of each model was checked using quantile-quantile plots and histograms and I inspected fixed-effect parameter estimates and standard errors for inflated values that would be symptomatic of multi-collinearity. I used the Akaike Information Criterion (AIC) to assess

relative goodness-of-fit and all five models were checked for implausible predicted values. I also performed model-based parametric bootstrap (with 10,000 simulations) to estimate the proportion of variation in the outcome explained by the whole model (i.e., by both fixed- and random-effects) and by only the fixed-effects using formulas for a conditional and marginal pseudo $R^2$ value, respectively.[113,114] I reported the median marginal and conditional pseudo $R^2$ values from the bootstrapped samples, along with 95% confidence intervals (using the percentile method).

**Table 2.1: Measures used in this study**

| Measure type | Measure | Temporal coverage | Description | Data source(s) | Limitations |
|---|---|---|---|---|---|
| Outcome | Rate of infant entry to care. | 2006/07 to 2013/14 | The number of children who first enter care during infancy, per 10 000 infants in the LA population, by financial year of first entry. | CLA return and ONS mid-year infant population estimates, linked by LA. | If a child in care is transferred to the care of another LA, or is adopted but later returns to care, they will receive a new identification number. This could lead to double counting, though LA transfers and adoption breakdowns are uncommon. |
| Descriptive (i.e., not used in modelling) | Number of singleton live births recorded in HES APC. | 2006/07 to 2013/14 | Number of singleton live births recorded in HES APC where maternal age is non-missing and there is at least one English LSOA recorded in maternal HES APC record in the look-back period. | HES APC. | I only had access to data where date of birth was non-missing; therefore, births where maternal age was missing are not captured in this analysis. Two LAs were excluded for having fewer than 100 singleton live births in at least one year between 2006/07 and 2013/14. |
| Explanatory | LA population size. | 2006/07 to 2013/14 | Number of individuals living in the LA. | ONS mid-year population estimates. | The ONS only provide information on the accuracy of estimates from 2013 onwards. |
| Explanatory | % of live births with maternal history of ARA. | 2006/07 to 2013/14 | % of singleton live births recorded in hospital where the mother had at least one ARA* in the 3 years prior to delivery. | HES APC. | Up to 20 ICD-10 codes are available per episode of inpatient care in HES APC (up to 14 in 2006/2007); however, the number of codes recorded likely differs among hospitals. This may result in |

| Measure type | Measure | Temporal coverage | Description | Data source(s) | Limitations |
|---|---|---|---|---|---|
| | | | | | underestimation of this measure in some LAs. |
| Explanatory | % of live births where mother <20 years old. | 2006/07 to 2013/14 | % of singleton live births recorded in hospital where the mother was less than 20 years old at delivery. | HES APC. | There were very few quality issues with birth dates in the HES APC extract (e.g.,<10 or >50 years old at delivery). |
| Explanatory | % of live births where maternal LSOA history within the 10% most deprived LSOAs in England. | 2006/2007 to 2013/14 | % of singleton live births recorded in hospital where the mother lived in one of the 10% most deprived LSOAs in England (according to the 2010 IMD) within the 3 years prior to delivery. | HES APC (linked by LSOA to 2010 IMD measures). | The LSOA used to derive maternal deprivation could be up to 3 years out of date at time of delivery. In addition, where women with multiple LSOAs recorded in the look-back period, each LSOA was linked to the 2010 IMD deciles and the minimum decile of deprivation (ie, most deprived) from all LSOAs recorded was selected. |
| Explanatory | % of live births where child has a congenital anomaly. | 2006/07 to 2013/14 | % of singleton live births with mother-baby linkage where the child had a congenital anomaly identified via ICD-10 codes† in the child's HES APC record (within the first 2 years of life or recorded on a death | HES APC. | Information on children with congenital anomalies was only available for births with mother–baby record linkage. Therefore, this measure was calculated using only singleton live births with linkage available. A further nine LAs were excluded as they were missing mother–baby record linkage for more than 35% of singleton live births in at |

| Measure type | Measure | Temporal coverage | Description | Data source(s) | Limitations |
|---|---|---|---|---|---|
| | | | certificate before the age of 5 years old).(to capture children whose congenital anomaly diagnosis was not captured at birth or who were diagnosed later in life). | | least one financial year between 2006/2007 and 2013/2014. |
| Explanatory | % of live births with low birth weight. | 2010/11 | % of singleton live births where child had a low birth weight—identified where recorded birth weight <2500 g or a low birth weight-related ICD-10 code (P05.0, P07.0 or P07.1) was recorded in child's HES APC record within 7 days of delivery. | HES APC. | There is considerable variation in quality of birthweight recording by hospitals. Where birth weight was missing in the delivery record but mother–baby linkage was available, I looked for recorded birth weight in the child's birth record and for ICD-10 codes related to low birth weight. The quality of birthweight recording also varied from year to year and therefore I decided to use data only from the 2010/2011 year (the midpoint of the study period).<br>A further nine LAs were excluded as they were missing a recorded birth weight in the maternal or child (where available) HES APC record at birth for more than 35% of singleton live births between April 2010 and March 2011. |

| Measure type | Measure | Temporal coverage | Description | Data source(s) | Limitations |
|---|---|---|---|---|---|
| Explanatory | % of dependent child households with lone parent. | 2011 | % of households with dependent children (i.e., children aged 0–15 years old), where there is a single parent. | Census 2011 (Table LC1109EW). | |
| Explanatory | Rate of violent crime (per 100 LA residents). | 2010/11 | The number of violence against the person offences, based on police-recorded crime data, per 100 people residents in the LA. | Public Health England Fingertips (Indicator 11202). | This does not capture violent crimes not reported to, or recorded by, the police. In addition, rate of violent crime in city centres with few residents (such as the City of London) may be inflated as there will be large numbers of people commuting into these areas who are not counted in the population denominator. |

*I defined history of ARA as any episode of admitted patient care related to substance misuse, mental health problems (including self-harm) or exposure to violence in the look-back period, determined by several non-mutually exclusive lists of ICD-10 codes.[102–105]

†Diagnoses of congenital anomalies were identified using a subset of Feudtner et al's ICD-10 code list (i.e., all Q codes).[110]

ARA = adversity-related hospital admission; CLA = Children Looked After; HES APC = Hospital Episode Statistics Admitted Patient Care; ICD-10 = International Statistical Classification of Diseases and Related Health Problems 10th Revision; IMD = Index of Multiple Deprivation; LA = local authority; LSOA = lower-layer super output area.

## 2.3 Results

### 2.3.1 Local authority characteristics

Table 2.2 summarises the LA characteristics for the study cohort by financial year. The median number of residents per LA increased over time (56 455 residents in 2006/2007 vs 60 426 in 2013/2014), while the median number of live births (3288 in 2006/2007 vs 3415 in 2013/2014) and the median percentage of live births where maternal LSOA history was within the 10% most deprived English LSOAs (14.46% in 2006/2007 vs 14.72% in 2013/2014) remained stable. Across all 131 LAs, the median rate of infant entry into care (72.76 per 10 000 in 2006/2007 vs 90.14 in 2013/2014) and the median percentage of live births with maternal history of adversity-related hospital admissions (2.73% in 2006/2007 vs 7.01% in 2013/2014) increased over time. LA-specific rates for both these measures varied substantially each year between LAs. The median percentage of live births where the child had a congenital anomaly also increased over time (1.64% in 2006/2007 vs 1.93% in 2013/2014), although LA variation decreased over time (min, max: 0.60%, 3.34% in 2006/2007 vs 1.03%, 3.22% in 2013/2014). Both the median percentage of live births to mothers under 20 years old (7.01% in 2006/2007 vs 4.33% in 2013/2014) and the LA variation in this measure (min, max: 1.14%, 14.50% in 2006/2007 vs 0.87%, 8.49% in 2013/2014) decreased over time. There was variation between LAs in the proportion of live births with low birth weight (min, max: 4.22%, 9.94%), the rate of violent crime (0.52, 3.17 per 100 residents) and the proportion of dependent child households with a lone parent (9.78%, 30.94%).

### 2.3.2 Prevalence and type of maternal adversity-related hospital admissions before birth

Prevalence of maternal history of adversity-related hospital admissions was typically highest in local authorities in the North West of England and lowest among London local authorities (Figure 2.2) Increases in the prevalence of adversity-related hospital admissions over time were chiefly driven by diagnoses for depression and anxiety disorders (Figure 2.3). Diagnoses related to mental health disorders and substance

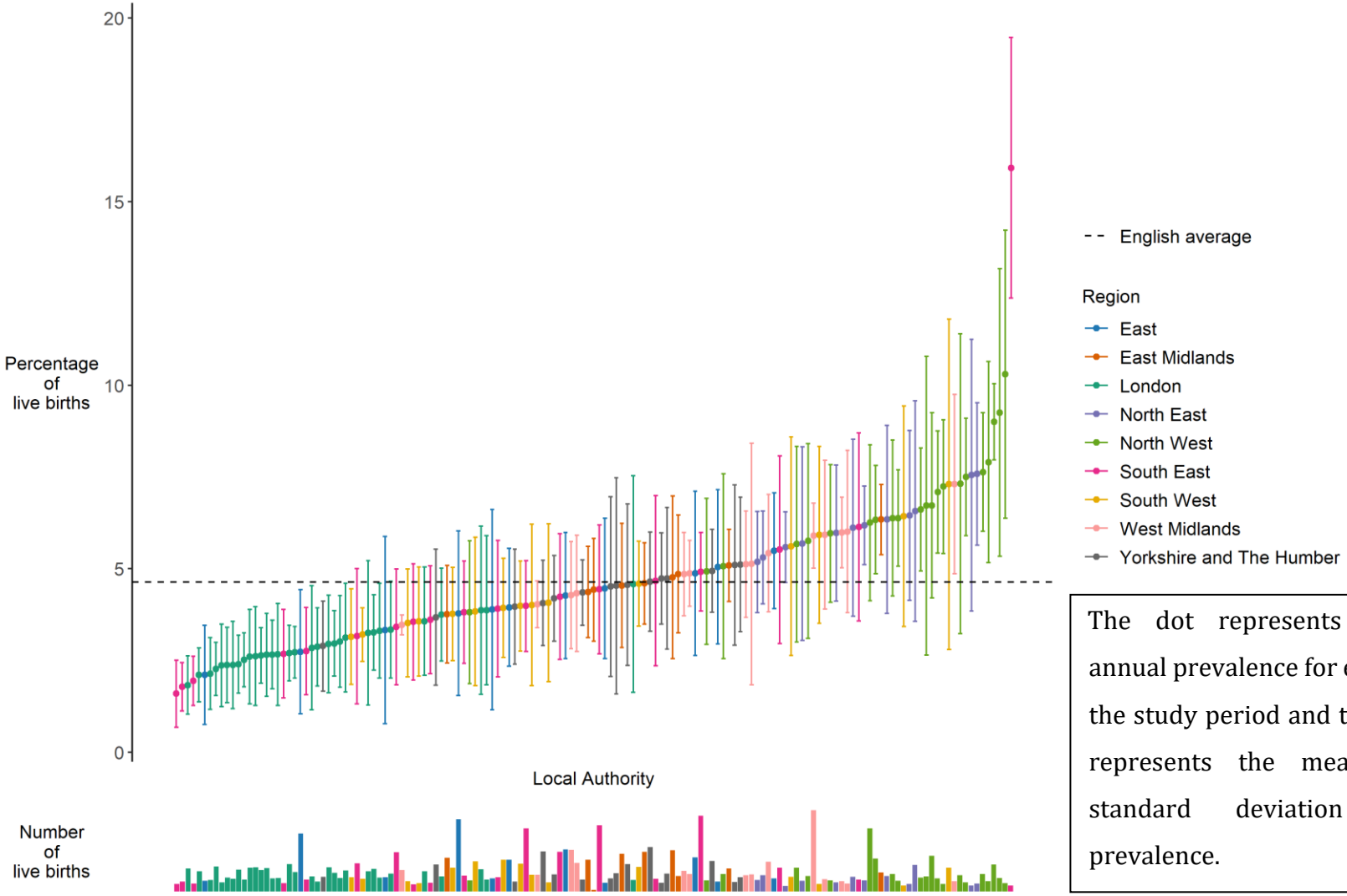
misuse were the most common types of maternal adversity-related hospital admissions among all live births with a maternal history of adversity-related hospital admissions .

**Table 2.2: Local authority characteristics among the study cohort, over the study period**

| LA characteristics (median [min, max]) | 2006/07 (N = 131) | 2007/08 (N = 131) | 2008/09 (N = 131) | 2009/10 (N = 131) | 2010/11 (N = 131) | 2011/12 (N = 131) | 2012/13 (N = 131) | 2013/14 (N = 131) |
|---|---|---|---|---|---|---|---|---|
| Number of singleton live births recorded in HES APC | 3288 [323, 16,076] | 3416 [299, 16,687] | 3454 [295, 16,847] | 3516 [309, 16,722] | 3552 [264, 16,734] | 3550 [298, 17,132] | 3440 [333, 16,932] | 3415 [303, 16,438] |
| Rate of infant entry to care (per 10,000) | 72.76 [0.00, 240.00] | 66.25 [8.83, 184.70] | 72.99 [4.62, 197.18] | 79.19 [0.00, 280.26] | 81.89 [4.51, 195.74] | 90.16 [10.26, 253.56] | 93.05 [0.00, 318.51] | 90.14 [13.94, 269.50] |
| LA population (000s) | 56 [8, 313] | 57 [8, 316] | 57 [8, 318] | 58 [8, 319] | 59 [8, 321] | 59 [8, 323] | 60 [8, 324] | 60 [8, 326] |
| % of live births with maternal history of ARA | 2.73 [0.52, 10.07] | 2.89 [0.95, 8.91] | 3.15 [1.19, 9.09] | 3.66 [0.90, 9.36] | 4.33 [1.49, 11.14] | 5.21 [1.43, 12.53] | 6.15 [1.71, 15.94] | 7.01 [3.12, 16.19] |
| % of live births where mother < 20 years old | 7.01 [1.14, 14.50] | 6.82 [1.46, 14.13] | 6.58 [1.35, 12.82] | 6.44 [1.50, 13.89] | 5.72 [1.17, 11.89] | 5.39 [1.13, 10.77] | 5.16 [1.30, 9.93] | 4.33 [0.87, 8.49] |
| % of live births where maternal LSOA history within 10% most deprived LSOAs | 14.46 [0.00, 60.18] | 14.98 [0.00, 60.46] | 14.64 [0.00, 61.92] | 15.33 [0.00, 60.90] | 14.87 [0.00, 60.36] | 14.75 [0.11, 61.21] | 14.47 [0.00, 61.52] | 14.72 [0.24, 60.68] |
| % of live births with congenital anomaly | 1.64 [0.60, 3.34] | 1.64 [0.84, 3.25] | 1.62 [0.60, 2.74] | 1.78 [0.84, 3.68] | 1.78 [0.93, 3.19] | 1.81 [1.06, 3.38] | 1.83 [1.11, 3.61] | 1.93 [1.03, 3.22] |
| % of live births with low birth weight | | | | | 6.26 [4.22, 9.94] | | | |
| % of dependent child households with lone parent | | | | | 18.31 [9.78, 30.94] | | | |
| Rate of violent crime (per 100 LA residents) | | | | | 1.14 [0.52, 3.17] | | | |

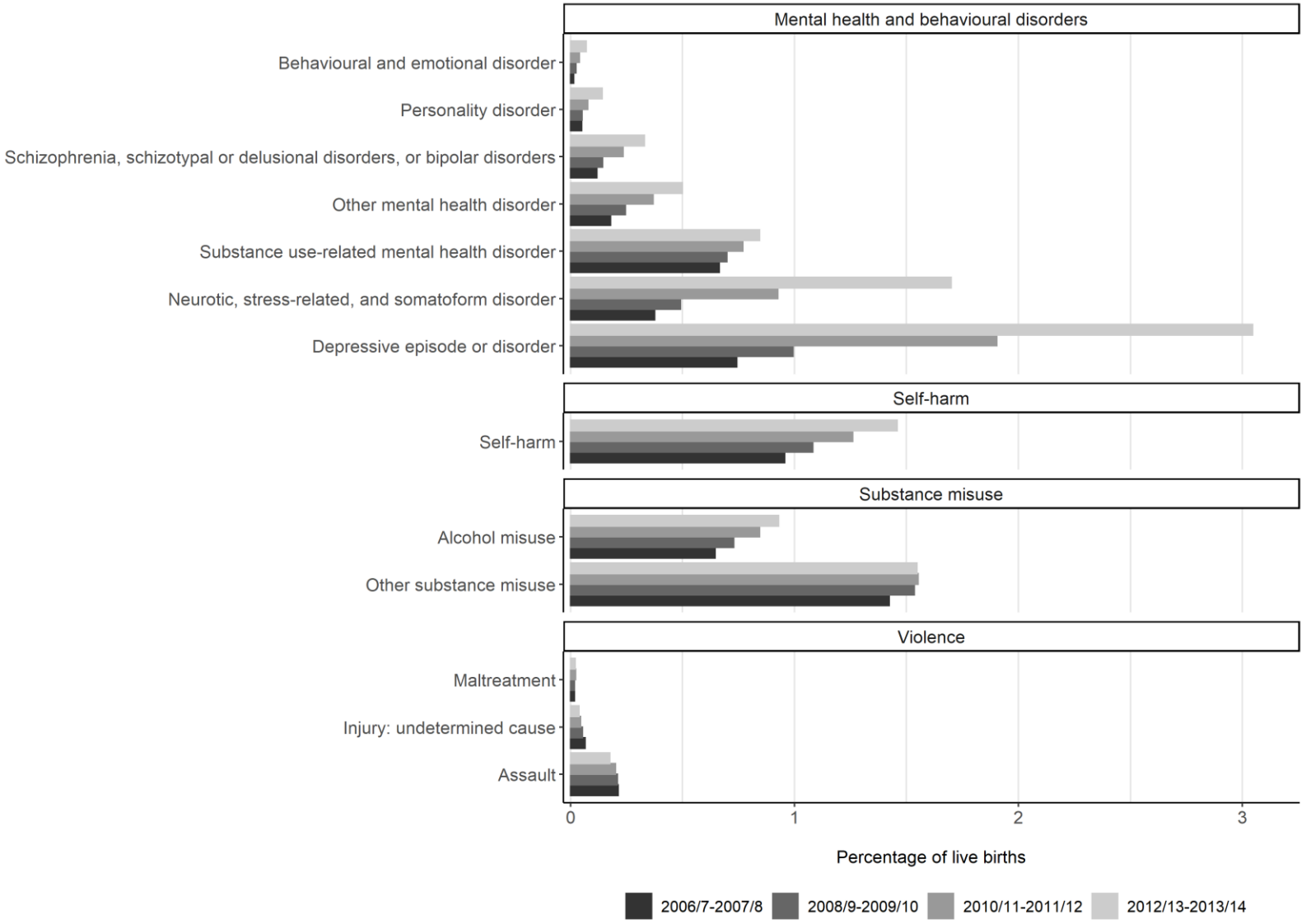
**Note:** The median LA value is presented as many of the explanatory measures are non-normally distributed. ARA = adversity-related hospital admission; HES APC = Hospital Episode Statistics Admitted Patient Care; LA = local authority; LSOA = lower-layer super output area.

**Figure 2.2: Regional and local authority variation in prevalence of maternal adversity-related hospital admissions before birth among singleton live births among the study cohort (n = 131)**




The dot represents the mean annual prevalence for each LA over the study period and the error bar represents the mean +/- the standard deviation of the prevalence.

**Figure 2.3: Prevalence of maternal adversity related hospital admissions among live births (n = 453,4286), by diagnoses and over time**



### 2.3.3 Modelling the association between rate of infant entry into care and prevalence of maternal adversity-related hospital admissions before birth

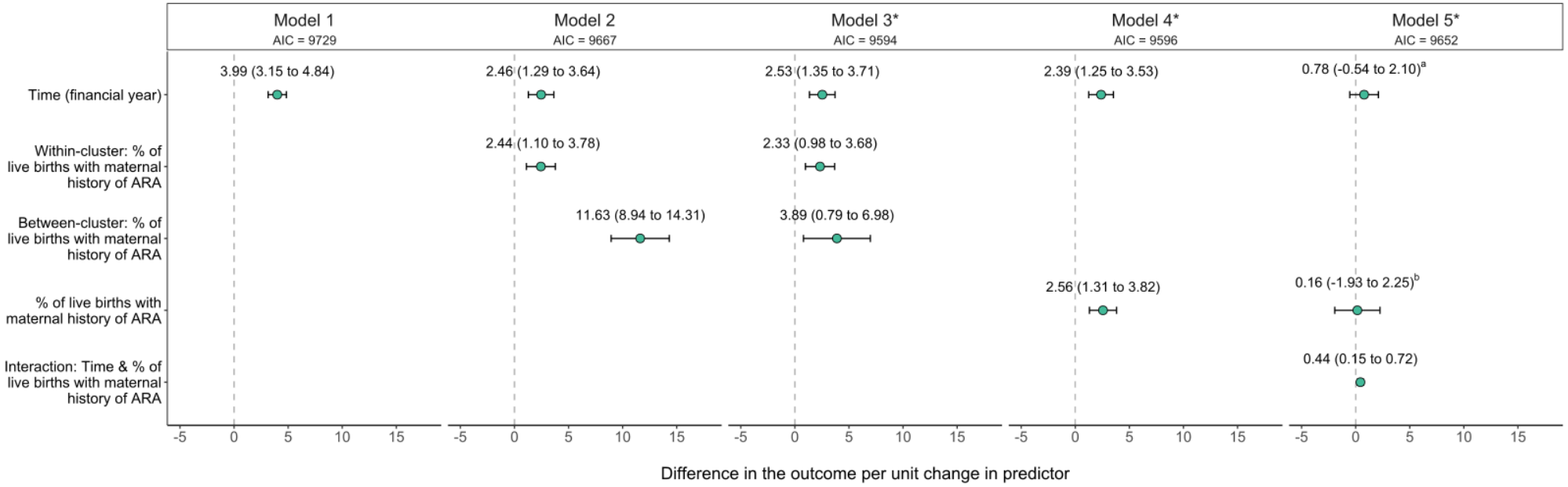
Figure 2.4 displays the point estimates and 95% CIs from models 1-5 for the coefficients of the time-varying covariates. Prior to adjustment (i.e., model 2), a percentage point increase in the percentage of live births with maternal history of adversity-related hospital admissions *within the same LA* was associated with an extra 2.44 infants, per 10 000, entering care (95% CI: 1.10-3.78). A percentage point increase *between two different LAs* was associated with an extra 11.63 infants, per 10 000, entering care (95% CI: 8.94-14.31). After adjustment for all other explanatory measures (i.e., model 3), there was insufficient evidence that these two effects (i.e., within the same LA and between two different LAs) differed in magnitude (p=0.36). After refitting the adjusted model without disaggregation of the within-LA and between-LA effects (i.e., model 4), there was evidence that a percentage point increase in the percentage of live births with maternal history of adversity-related hospital admissions , either within the same LA or between two different LAs, was associated with an extra 2.56 infants per 10 000 entering care (95: CI: 1.31-3.82) per annum, holding all other model covariates constant. In my final model (i.e., model 5), there was evidence that the magnitude of the association between the percentage of live births with maternal history of adversity-related hospital admissions and rate of infant entry into care increased over time between 2006/2007 and 2013/2014 (interaction coefficient estimate: 0.44, 95% CI: 0.15-0.72), as seen in Figure 2.5. Full model results are available from Table A 2.3, Table A 2.4 and Table A 2.5 in the chapter appendix.

### 2.3.4 Contribution of prevalence of maternal adversity-related hospital admissions before birth in explaining variation

Using models 1 and 2, I estimated that the percentage of live births with a maternal history of adversity-related hospital admissions explained 24% (95% CI: 14% to 35%) of the variation in the rate of infant entry into care between 2006/2007 and 2013/2014 (Figure 2.6). Using my final model (model 5), all model covariates (i.e., fixed-effects)

explained an estimated 54% (47-60%) of the variation in local authority rates of infant entry into care across England between 2006/2007 and 2013/2014.

**Figure 2.4: Modelling the association between LA-specific percentage of live births with maternal history of adversity-related hospital admissions and LA-specific rate of infant entry into care for 131 English LAs, over time (2006/2007 to 2013/2014).**



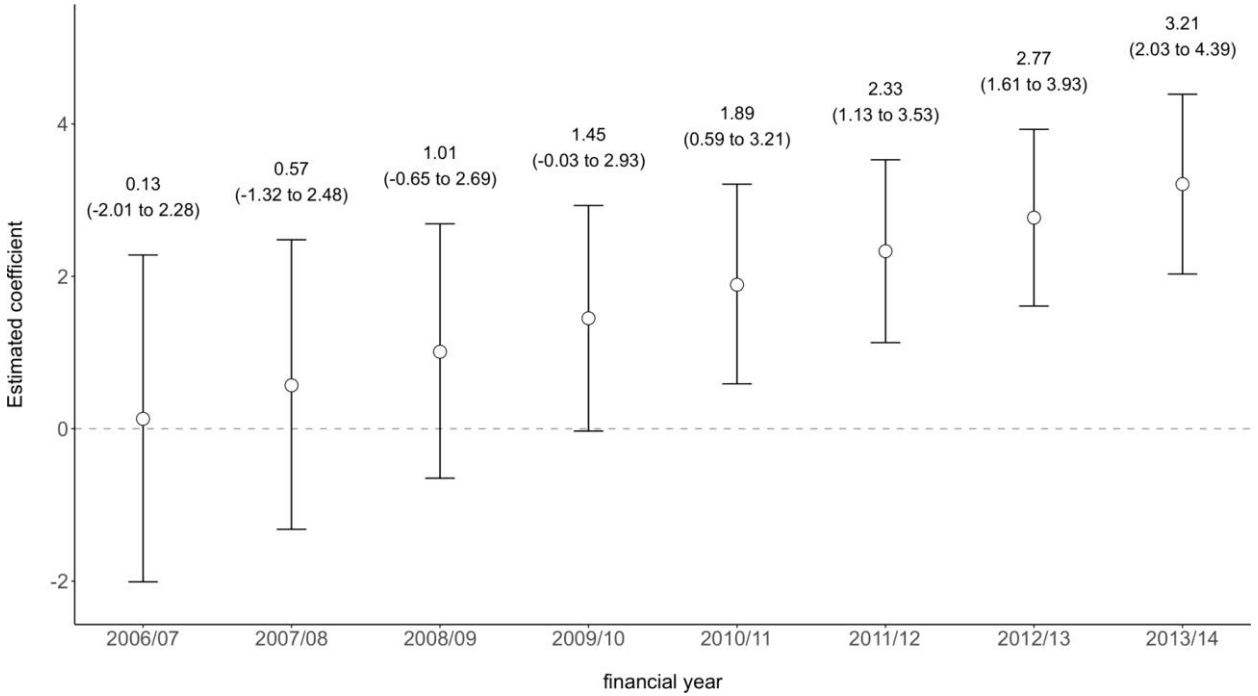

*Models were adjusted for all other explanatory measures (Table 2.1). The term 'fixed-effects' includes any explanatory measure in the model, such as time and maternal history of ARA, but does not include random effects such as random intercepts and random slopes; 95% CI given in brackets.

[a] Effect where the percentage of live births with maternal history of ARA is equal to zero.

[b]Effect in 2006/2007.

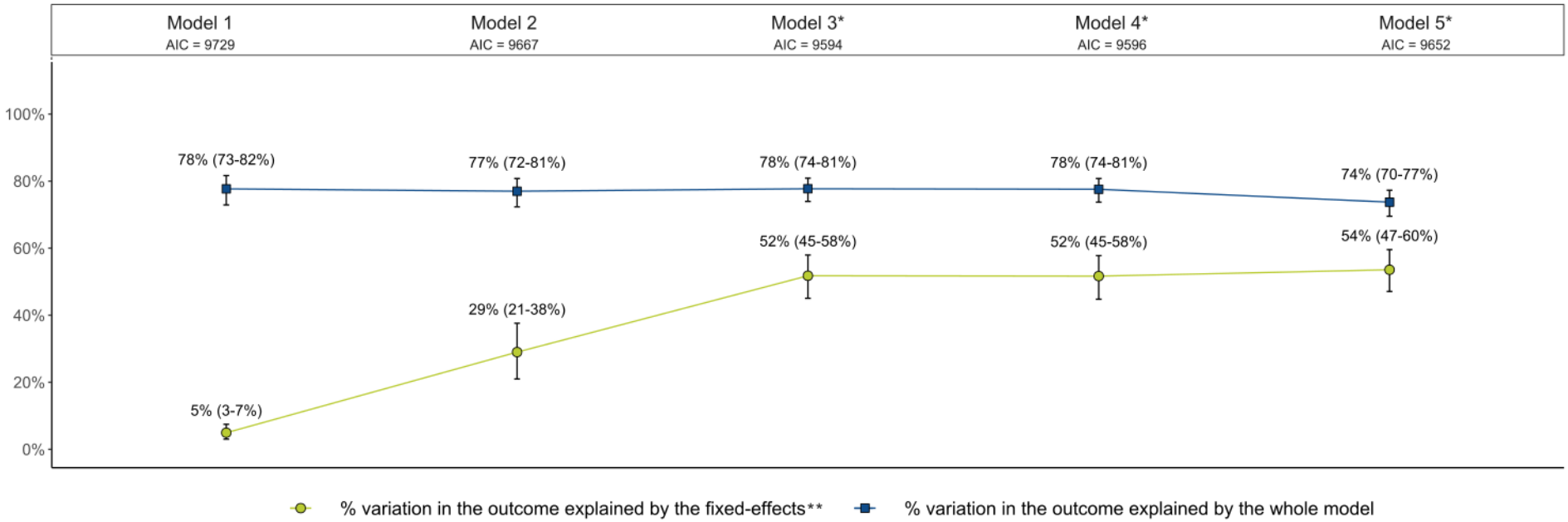
AIC, Akaike information criterion; ARA, adversity-related hospital admission; LA, local authority.

**Figure 2.5: Exploring changes in the association between the LA-specific percentage of live births with maternal history of adversity-related hospital admissions and LA-specific rate of infant entry into care between 2006/2007 and 2013/2014.**




Model 5 was adjusted for all other explanatory measures (Table 2.1).

**Figure 2.6: Variation in local authority rate of infant entry into care explained by the model**




*Models were adjusted for all other explanatory measures (Table 2.1). The term 'fixed-effects' includes any explanatory measure in the model, such as time and maternal history of ARA, but does not include random effects such as random intercepts and random slopes; 95% CI given in brackets.
AIC, Akaike information criterion; ARA, adversity-related hospital admission; LA, local authority.

## 2.4 Discussion

### 2.4.1 Key findings

I found that increases either between LAs or within the same LA over time in the rate of infant entry into care were associated with an increased prevalence of maternal history of adversity-related hospital admissions . Evidence for this association persisted even after controlling for other, potentially confounding, LA-level risk factors for entry to care. The magnitude of the increase in rate of infant entry into care per percentage point increase in the percentage of live births with maternal history of adversity-related hospital admissions increased over time, particularly from 2009/2010 onwards (2.3). I estimated that the percentage of live births with maternal history of adversity-related hospital admissions alone explained between 14% and 35% of the LA variation in rate of infant entry into care over the study period. The final model, with all covariates included, explained 47% to 60% of this variation.

### 2.4.2 Strengths and limitations

This is the first published UK study to account for maternal health-related risk factors when examining variation among English LA rates of entries into care. A key strength of this study is the breadth of information on mothers and children included in the models. Six out of nine of the measures were derived using two national, longitudinal databases (HES APC and CLA), each with person-level records enabling follow-up through health and social care services throughout England over time. In particular, HES APC captures diagnoses via ICD-10 codes, allowing me to identify adversity-related healthcare need among mothers up to 3 years before delivery (i.e., maternal history of adversity-related hospital admission ) that was sufficiently severe to be recorded during a hospital admission. Many of the adversity-related hospital admission codes have been previously validated in other populations. [106–109] Another strength is the inclusion of multiple risk factors for maltreatment and infant entry into care in statistical modelling. I designed the modelling approach to balance model parsimony with adjustment for confounders that were supported by external evidence, which were relevant to policy and measurable.

I further preserved model parsimony by allowing only the main exposure (maternal history of adversity-related hospital admissions ) to vary over time, while fixing all other model covariates at their 2010/2011 values. Most of the explanatory measures in this final model were derived from administrative hospital records (HES APC), highlighting the importance of considering indicators for parental health near to birth when exploring LA variation in rate of infant entry to care.

The main limitation of this study sits with its ecological design. While I found that increases in the percentage of live births with maternal history of adversity-related hospital admissions are associated with increases in the rate of infant entry to care over a given area, I am unable to examine whether children born to women with a history of adversity-related admission prior to birth were more likely to be placed into care during infancy. However, there is currently no English database containing mother-to-baby linked healthcare data with onward linkage to information on children's social care outcomes.

Another limitation is that I did not explore the effect of increases to LA prevalence of maternal history of hospital admissions related to particular types (or combination of types) of adversity prior to birth. I took this decision partly to reduce the risk of type I error inflation due to excessive statistical testing (relative to the sample size) and partly because a number of LAs had small, non-disclosable values (<10) for this measure when stratified by type (or combination of types) of adversity. There is also a lack of information on 'supply-side' factors to infant entry to care, such as funding for early intervention programmes and availability of foster care placements, of sufficient quality for research at the LA level for the whole of England. A further limitation is that I cannot distinguish whether increases over time in the percentage of live births with maternal history of adversity-related hospital admissions reflect a true increase or are partly explained by nationwide changes in coding practices, although adversity admissions appear to be increasing particularly among younger women.[115] Finally, I was unable to include paternal health-related risk-factors as it is not possible to identify fathers in HES APC. I was also restricted to hospital indicators of adversity as I did not have access to English primary care data and therefore maternal adversity-related hospital

admissions is likely underestimated, representing only the most severe problems and those reported at the birth admission.

The limitations of this study highlight the need to establish a linked parent-child healthcare data resource with onward linkage to child protection outcomes. This would enable more robust evaluation of the association between maternal adversity-related hospital admissions and other health indicators and infant entry into care to inform prevention efforts. Such data linkages would be vital to inform policy strategies aimed at improving women's health, well-being and reproductive rights, and potentially reduce infant entries to care. To explore the benefits and limitations of using linked health and child protection data for mothers and their children, in Chapter 3 I performed a review of studies using linkages established in other settings. This review informed the development of the remainder of my thesis.

# Chapter 3: Literature review of data linkages

**Chapter overview**

In this chapter, I searched several databases for studies that used linked administrative data from child protective services and healthcare to identify mental health problems or substance misuse among women whose children who enter care. I synthesised their findings via a narrative synthesis and discussed the robustness of study findings with respect potential biases arising from the linkage, the data and the statistical methods. This work addressed objective 2 of this thesis:

*To explore the existing literature examining mental health and substance misuse among women whose children enter care using linked administrative child protection and health data sets.*

## 3.1 Rationale for the review

In recent years a growing number of researchers have begun to use linkages between administrative data on child protection and administrative data on health service use to better understand the relationship between maternal health and child protection interventions. These large-scale administrative linked datasets, based on whole populations, are often established through collaborations between governments, researchers and communities.[69,82,116–118] In some of these settings, linkages are performed by government linkage providers. For example, in Western Australia the Department of Health has a data linkage branch which performs routine linkage of health data sets as well as routine linkage of health to some non-health data sets collected by other government departments.[119] In other settings, linkages are performed by universities and researchers. For example, the University of Manitoba (Winnipeg, Canada) established the Manitoba Centre for Health Policy in 1991, funded by the provincial government of Manitoba, which is a data centre that hosts and links whole-population administrative data from Manitoba departments of health, education, and family services.[120] In England, NHS Digital provides a similar service but, unlike Western Australia and Manitoba, they do not have access to non-health data such as data from children's social care or the family courts and therefore bespoke requests must be made with the onus on the research to identify the legal basis for linkage, which can take

several years. To guide the development of my thesis, I gathered recent evidence generated by whole-population data linkage studies combining administrative child protection data and maternal health records in other settings.

## 3.2 Search strategy

I performed a systematic literature review, guided by the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) statement.[121] I searched Applied Social Sciences Index and Abstracts (ASSIA), Embase, MEDLINE, Scopus, and Web of Science for studies published since 1 January 2010 (to 21 February 2021) that used linkages between administrative healthcare data on mothers and official child protection records to identify mental health problems or substance misuse among women whose children who enter state care. I excluded linkages involving health data only from survey or cohort studies as the focus of this thesis was on the linkage of administrative health data with administrative data on children who enter care In addition, administrative health data is often widely available at low cost to researchers, with whole-population coverage of health service use. The date restriction was imposed as the use and linkage

**Box 3.1: Literature review inclusion/exclusion criteria**

- Published between 1 January 2010 and 21 February 2021.
- Used linked data combining administrative healthcare data (primary care, secondary care, or tertiary care services) and official child protection records to create a cohort of mothers or children.
- Retrospective cohort study design or matched cohort study design.
- Outcome (or exposure) included child entry into care, family court proceedings concerning entry into care, child protection plans, being referred to child protective services (e.g., an official allegation of maltreatment), having a substantiated allegation of maltreatment.
- Exposure (or outcome) included indicators for maternal mental illness or maternal substance misuse.
- English language.
- Original research or review article.

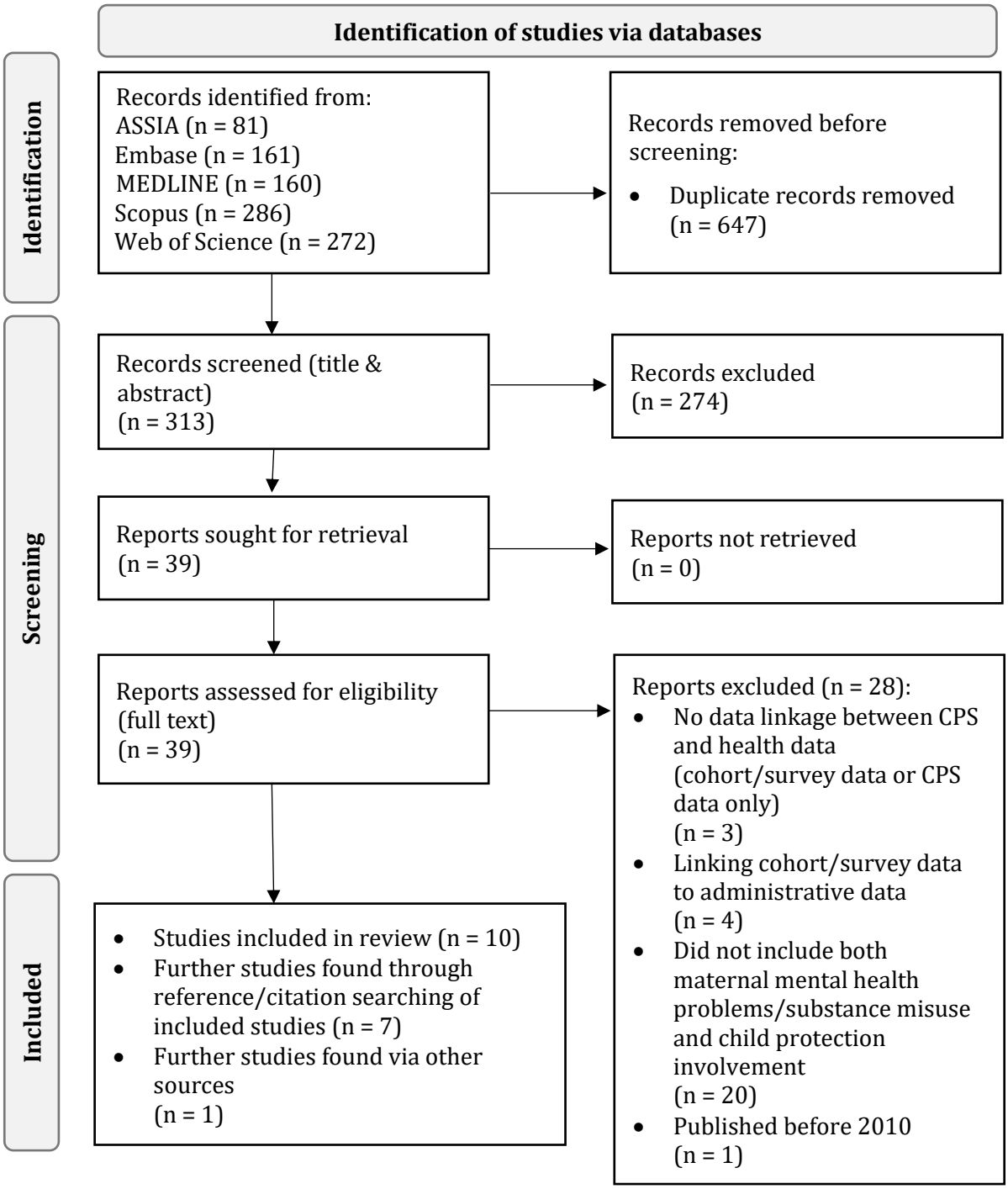
of administrative data is relatively novel in this field and helped to reduce the large number of results returned.[78] All inclusion and exclusion criteria applied are shown in Box 3.1. The search terms are available in Appendix 3.

I included any form of child protective services (CPS) involvement as primary exposure or outcome due to the small number of studies returned after an initial search focussing just of child entry into care. I additionally included studies where no primary exposure was defined but maternal mental health and substance misuse were included as one of many explanatory measures.

## 3.3 Summary of the literature review results

My search returned 313 unique studies (Figure 3.1). After screening abstracts and full-text, 10 studies met the inclusion/exclusion criteria.

**Figure 3.1: PRISMA flow diagram of search strategy and results**




ASSIA = Applied Social Sciences Index and Abstracts; CPS = child protective services.

I found a further seven studies by performing a snowball search of references and citations of included studies. One additional study was identified through professional networks. Therefore, a total of 18 studies were included in the review.

Most studies found were conducted in Australia (N = 7, 36.8%) or Canada (N = 6, 31.6%), including one country-comparison study that used linked data from both Australia and Canada (Table 3.1).[32,63,66–68,70,122–127] Just five were from European countries including Denmark and Wales; none were from England.[71,84,128,129] Most (N = 14, 77.8%) were published in the last five years, highlighting the acceleration of this type of research in recent years. Maternal health, rather than CPS intervention, was the primary or secondary exposure in 77.8% of the studies. Over half (N = 10, 52.6%) of the 19 linkages across the 18 studies applied probabilistic algorithms using non-unique identifiers like names, addresses and dates of birth. Probabilistic linkage provides a measure of the probability that two sets of identifiers belong to the same individual (the 'match-weights').[130] This allows flexibility with researchers able to perform sensitivity analyses using different cut-off values for the match-weights to define matches and non-matches or by weighting observations by match-weight in statistical analyses. Deterministic linkage, on the other hand, uses a set of rules based on identifiers exactly or partially matching. Deterministic linkage was only used in studies conducted in settings where person-level data could be linked using a unique identifier (e.g., a personal identification number in Denmark and a personal health insurance number in Manitoba, Canada).[31,68] Studies linked a median of three health data sets to CPS records.

I could not perform a meta-analysis due to the large differences in sample inclusion/exclusion criteria, study design, data sources, and derived measures among the 18 studies. Instead, I undertook a narrative synthesis, discussing the prevalence of 1) CPS interventions among women with mental health problems and/or substance misuse, and 2) maternal mental health problems and/or substance misuse among women with children subject to CPS intervention. I also discussed the adjusted association between maternal mental health problems and/or substance misuse and CPS intervention. In their heterogeneity, these studies provide insight on the wide range of indicators for maternal mental health and substance use that have been derived from administrative health records. These include hospitalisations, outpatient contacts, medications, clinical diagnoses or symptoms, and referrals to specialist healthcare services.

**Table 3.1: Characteristics of the included studies**

| Characteristics | N | % |
|---|---|---|
| Number of studies | 18 | |
| Published since 2016 (i.e., last 5 years) | 14 | 77.8 |
| **Country*** | | |
| Australia | 7 | 36.8 |
| Canada | 6 | 31.6 |
| Denmark | 3 | 15.8 |
| United States | 2 | 10.5 |
| Wales | 1 | 5.3 |
| **Unit of study** | | |
| Mothers | 6 | 33.3 |
| Children | 12 | 66.7 |
| **Exposure** | | |
| Maternal health (mental health problems or substance misuse) | 14 | 77.8 |
| Child protection | 4 | 22.2 |
| **CPS indicator** | | |
| Out-of-home care | 14 | 77.8 |
| Other | 4 | 22.2 |
| **Maternal mental health problems and substance misuse indicators** | | |
| Maternal mental health only | 7 | 38.9 |
| Maternal substance use only | 1 | 5.6 |
| Both | 10 | 55.6 |
| **Study design** | | |
| Retrospective whole-population cohort | 11 | 61.1 |
| Retrospective matched cohort | 7 | 38.9 |
| **Linkage method*** | | |
| Deterministic only | 8 | 42.1 |
| Probabilistic only | 10 | 52.6 |
| Not reported | 1 | 5.3 |
| **Linkage identifiers*** | | |
| Unique identifiers only (e.g., person identification number) | 8 | 42.1 |
| Non-unique identifiers only (e.g., names, addresses, date of birth) | 6 | 31.6 |
| Both unique and non-unique identifiers | 3 | 15.8 |
| Not reported | 2 | 10.5 |

| | | |
|---|---|---|
| **Reported linkage rates*** | | |
| Yes | 3 | 15.8 |
| No | 14 | 73.7 |
| Partial (where linkage between 3 or more data sets) | 2 | 10.5 |

* As one study performed a cross-country comparison between Manitoba, Canada and Western Australia, percentages for these measures are calculated from 19 rather than 18.

**Table 3.2: Studies with child protection as the outcome**

| Author/ Date/ Setting | Population | Maternal mental health or substance use exposure(s)/ Exposure type | Child protection outcome(s) | Statistical analysis | Linkage algorithm/ Linkage identifiers/ Linkage rate(s) |
|---|---|---|---|---|---|
| O'Donnell et al/ 2010/ Western Australia [124] | All children born in Western Australia between 1990-2005 (N = 397,345) | Maternal hospital admission related to mental health prior to first substantiated allegation/ Explanatory measure<br><br>Maternal hospital admission related to substance use prior to first substantiated allegation/ Explanatory measure | Time from birth to first substantiated child protection allegation (of maltreatment) | Multivariable cox regression, stratified by Aboriginal status (Yes/No)<br><br>Adjusted for gender, socio-economic disadvantage, intellectual disability, cerebral palsy and other birth defects, parental age at birth, and parental mental health, assault and substance use. | Probabilistic/ names, sex, date of birth and address/ Not reported |
| Ubbesen/ 2013/ Denmark [129] | All children born in Denmark between 1981-2008 who entered care before their third birthday (N = 11,034).<br><br>Control population: a quarter children born in Denmark between 1981-2008, | Maternal hospitalisation related to a psychiatric disorder prior to child's birth (Yes/No)/ Primary exposure | Time from birth to first OOHC placement before third birthday | Multivariable cox regression, allowing for time-varying covariate effects<br><br>Adjusted for sex, low birth weight, birth order, parental psychiatric history, parental employment status, parental partner status, | Deterministic/ Unique personal identification number ('CPR number')/ Not reported |

| | | | | | |
|---|---|---|---|---|---|
| | randomly selected (N = 515,773) | | | and having a teenage mother or father. | |
| O'Donnell et al/ 2015/ Western Australia [70] | All children born in Western Australia between 1990-2005 (N = 402,022) | Maternal hospital admission or outpatient contact related to mental health, prior to first maltreatment allegation/ Primary exposure | Time from birth to first child protection allegation (of maltreatment) | Multivariable cox regression. Follow-up time: birth to first allegation<br><br>Adjusted for gender, parental marital status, Aboriginality, parental age at birth, socioeconomic disadvantage, child disability, maternal assault-related admission, and housing issues | Probabilistic/ names, sex, date of birth and address/ Not reported |
| Ranning et al/ 2015/ Denmark [71] | All first-born singletons born in Denmark between 1982-2010 (N = 782,092) | Maternal hospital admissions and outpatient attendances related to schizophrenia, bipolar disorder and unipolar depression, prior to birth of child/ Primary exposures | Time from birth to first OOHC placement | Poisson regression. Offset units of 1000 person years at risk.<br><br>Adjusted for child age and calendar time. | Deterministic/ personal identification number/ Not reported |
| O'Donnell et al/ 2016/ Western Australia and Manitoba, Canada [32] | All children born in Western Australia between 1994-2005 (N = 303,057) and all children born in Manitoba 1998- | Maternal hospital admissions and outpatient attendances related to drug or mental health issues, Western Australia) / Explanatory measure | Time from birth to first OOHC placement | Multivariable cox regression.<br><br>Adjusted for sex, socioeconomic position, birth year, maternal age, maternal assault-related | Western Australia: Probabilistic/ names, sex, date of birth and address/ Not reported |

| | | | | | |
|---|---|---|---|---|---|
| | 2008<br>(N = 157,829) | Maternal hospital admissions related to drug or mental health issues (Manitoba)<br>/<br>Explanatory measure | | admission, and maternal drug or mental health related admission | Manitoba:<br>Not reported/<br>Not reported/<br>Not reported |
| Hafekost et al/ 2017/ Western Australia [125] | Women with a birth in Western Australia between 1983-2007 who had an alcohol-related diagnosis (N = 10,211)<br><br>Control population: Random selection of women with a birth in Western Australia between 1983-2007 who did not have an alcohol-related diagnosis, matched 2:1 for non-Indigenous women and 3:1 for Indigenous women on maternal age and child's birth year (N = 47,688) | Having an alcohol-related diagnosis recorded in hospital, mental health outpatients, or treated for an alcohol problem in a tertiary treatment centre/<br>Primary exposure<br><br>Timing of alcohol exposure (hierarchical & mutually exclusive):<br>1) during pregnancy<br>2) 1yr before pregnancy<br>3) 1yr postpartum<br>4) >1yr before pregnancy<br>5) >1yr postpartum/<br>Secondary exposure | 1. Ever had a substantiated allegation of maltreatment (Yes/No)<br>2. Ever placed into OOHC (Yes/No) | Multivariable logistic regression, standard errors clustered by family and matching variables.<br><br>Adjusted for Indigenous status, region, socioeconomic position, age, marital status, mental health problems, illicit drug use, parity, child foetal alcohol syndrome, child disability and child birth weight. | Probabilistic/ names, sex, date of birth and address/ Not reported but earlier linkages had estimated missed match rate of 0.11% and false match rate of 0.11% |
| Hammond et al / 2017/ California, | All children born in California in 2006 and linked to a | Maternal mental health recorded at delivery hospitalisation: | Ever had a maltreatment | Poisson GLM with a log-link and robust standard error adjustments | Probabilistic/ maternal Social Security number, |

| | | | | | |
|---|---|---|---|---|---|
| United States [69] | maternal hospital discharge record (N = 551,232) | Psychotic disorders<br>Mood disorders<br>Anxiety disorders<br>'MH disorder at delivery'/ Primary exposure<br>Maternal substance abuse recorded at delivery hospitalisation in 2006/ Secondary exposure | allegation before 1st birthday (Yes/No). | Adjusted for age at first birth, ethnicity, insurance type, paternity status, prenatal care status, parity, substance abuse. | parent and child first names ,or parent and child dates of birth/ 92% of children in CPS cohort linked to a birth record and 97% of maternal hospital discharge records (at delivery) linked to a birth record. |
| Prindle et al / 2018/ California, United States [131] | All children born in California in 2006 and linked to a maternal hospital discharge record (N = 551,232) | Prenatal substance exposure diagnosis recorded on the maternal or infant discharge record at hospital delivery/ Primary exposure | Before 1st birthday, ever (Yes/No) had a:<br>1) report of alleged maltreatment,<br>2) substantiated report of maltreatment, or<br>3) placement in OOHC. | Poisson GLM with a log-link and robust standard error adjustments<br>Adjusted for maternal age at first birth, maternal ethnicity, birth payment method, initiation of prenatal care, paternity status, birth order and birth weight. | Probabilistic/ maternal Social Security number, parent and child first names ,or parent and child dates of birth/ 92% of children in CPS cohort linked to a birth record and 97% of maternal hospital discharge records (at delivery) linked to a birth record. |
| Vigod et al / 2018/ Denmark [128] | All children born in Denmark between | Maternal mental disorder recorded during a psychiatric | Ever had an OOHC placement (Yes/No). | Poisson regression using generalized estimating equations | Deterministic/ Unique personal identification |

| | | | | | |
|---|---|---|---|---|---|
| | 1982-2012<br>(N = 1,868,467) | inpatient our outpatient contacts (mutually exclusive groups):<br>1) diagnosed >1yr before birth<br>2) diagnosed <1yr before birth<br>3) diagnosed 0-3mos postpartum<br>4) diagnosed 4-12mos postpartum<br>5) no diagnosis by 1yr postpartum (reference category)./<br>Primary exposure<br><br>Any psychiatric inpatient or outpatient contact for any mental disorder/<br>Secondary exposure | Note: OOHC occurring before 1st birth was not counted. | Children were followed from their first birthday until January 1, 2013; with censoring at their 18th birthday, emigration out of the country, death or first maternal MH diagnosis after 1 year postpartum.<br><br>Adjusted for child age (time-dependent), sex, calendar year (time-dependent), maternal and paternal age, parity, and paternal psychiatric contact (time dependent). | number ('CPR number')/<br>Not reported |
| Wall-Wieler et al /<br>2018/<br>Manitoba, Canada [68] | All women whose first child was born in Manitoba 2002-2012 (and had been resident for at least two years)<br>(N = 53,565) | Diagnoses recorded during a hospitalisation or physician visit before birth for:<br>Mood and anxiety disorders (prescriptions for antidepressants, benzodiazepines, or lithium also included), | First child was placed in OOHC within seven days of birth (Yes/No). | Logistic regression model.<br><br>Adjusted for developmental disability, criminal justice involvement, receipt of employment and income assistance, moved home, gestational age, prenatal | Deterministic/<br>Personal health insurance number/<br>Not reported |

| | | | | | |
|---|---|---|---|---|---|
| | | Schizophrenia,<br>Suicide attempt,<br>Substance use/ explanatory measures | | care, teenage mother status, urban neighbourhood, maternal childhood care placement, year of birth, socioeconomic position as well as the mental health and substance misuse measures | |
| Green et al / 2018/ New South Wales, Australia [127] | All children born in New South Wales between 2003-2005 who entered full-time schooling in 2009 Australian Early Development Census (AECD) or the 2015 Middle Childhood Survey (MCS) (N = 72,079) | Maternal diagnosis of a mental disorder before their child's first OOHC placement<br><br>Diagnoses from hospitalisations and outpatient attendances, A&E attendances, and public mental health services. | Entry to OOHC before age 13-14 (Yes/No) | Multivariable logistic regression.<br>Two analyses performed:<br>1) sample restricted to children with OOHC placement OR no CPS contact<br>2) sample restricted to children with a CPS report<br><br>Adjusted for child sex, socioeconomic status, Aboriginal status, special educational needs, emotional or behavioural problems, home environment problems, maternal age, low birth weight, maternal smoking, antenatal care, maternal parental criminality, paternal mental health | Probabilistic/ name, sex, date of birth, address/ AEDC had 99.7% coverage of the eligible population and 79.4% of children in NSW-CDS linked to mother/father records) |

| | | | | | |
|---|---|---|---|---|---|
| | | | | disorder, and parental death. | |
| O'Donnell et al/ 2019/ Western Australia [122] | All children born in Western Australia between 1990-2010 (N = 524,534) | Maternal mental health and substance -related hospitalisations and outpatient contacts at any time (1970-2010) | Ever entered OOHC before 1st birthday (Yes/No) | Multivariable logistic regression<br><br>Adjusted for aboriginality, maternal/paternal age, maternal mental health contact, maternal substance-related contact, parent marital status, child disability, socioeconomic position, and remoteness. | Probabilistic/ names, sex, date of birth and address/ Not reported |
| Griffiths et al / 2020/ Wales [84] | All women with an infant in care proceedings in Wales between 2015-2018 (N = 1111)<br>Control population: A random selection of women with a live birth in Wales, matched on age band at birth, deprivation quintile (N = 23,414) | Self-reported mental health problem at initial maternity assessment/ explanatory measure<br><br>mental health -related GP contact or hospitalisation during i) pregnancy or ii) 2yrs before birth/ explanatory measure<br><br>Substance use -related GP contact or hospital admission during i) pregnancy or ii) 2yrs | Ever had an infant in care proceedings (Yes/No) | NA – descriptive statistics only | Probabilistic/ anonymised linking field (ALF) based on NHS number, names, sex, date of birth and postcode/ 91% of women with an infant in care proceedings between 2015-2018 had linked data available. |

| | | | | | |
|---|---|---|---|---|---|
| | | before birth/ explanatory measure | | | |
| Whitten et al / 2020/ New South Wales, Australia [123] | All children born in New South Wales between 2003-2005 who entered full-time schooling in 2009 AECD or the 2015 MCS, with linked mother/father records, followed to 2016 (N = 71,661) | Maternal diagnosis of a mental disorder before their child's first OOHC placement<br><br>Diagnoses from hospitalisations and outpatient attendances, A&E attendances, and public mental health services. | Time from birth to first OOHC placement | Multivariable cox proportional hazards regression.<br><br>Adjusted for parental conviction, parental mental health diagnosis, maternal smoking during pregnancy, Aboriginality status, socioeconomic position, and maternal age at birth. | Probabilistic/ name, sex, date of birth, address/<br><br>AEDC had 99.7% coverage of the eligible population and approximately, 78% of children in the AECD or MCS had linked mother and father records. |

AECD = Australian Early Development Census, A&E = accident and emergency department, OOHC = out-of-home care; GP = General Practitioner; MCS = Middle Childhood Survey.

**Table 3.3: Studies with child protection as the exposure**

| Author/ Date/ Setting | Population | Child protection exposure(s)/ Exposure type | Maternal mental health or substance use outcome(s) | Statistical analysis | Linkage algorithm/ Linkage identifiers/ Linkage rate(s) |
|---|---|---|---|---|---|
| Wall-Wieler et al / 2018/ Manitoba, Canada [63] | All women whose oldest child was born in Manitoba between 1992-2015 (and had been resident for at least two years) and taken into care and had a sister whose oldest child was not taken into care (N = 1872)<br><br>Control population 1:<br>Biological sisters whose oldest child was not taken into care (N = 1872)<br><br>Control population 2:<br>Other mothers whose oldest child received CPS services but did not enter care (N = 9590) | 1) had a child placed in OOHC, or<br><br>2) had no child placed in OOHC (biological sisters only), or<br><br>3).had no child placed in OOHC (other mothers receiving CPS services)/ Primary exposure | 1) Death due to suicide<br><br>2) Hospitalisation related to suicide attempts | Multivariable Poisson regression with person-years at risk offset.<br><br>Adjusted for socioeconomic status, neighbourhood, age of mother, age of child and maternal mental health conditions <2 years before child entering care including suicide attempts (yes/no), number of substance use diagnoses, number of mood and anxiety disorder diagnoses. | Deterministic/ Personal health insurance number/ Not reported |

| | | | | | |
|---|---|---|---|---|---|
| Wall-Wieler et al / 2018/ Manitoba, Canada [67] | All women whose oldest child was born in Manitoba between 1997-2015 and entered OOHC (N = 5792)<br><br>Control population:<br>All women whose first child was born in Manitoba between 1997-2015 and died (n = 1143) | 1) Oldest child in OOHC, or<br><br>2). Oldest child died/<br>Primary exposure | Diagnoses made during physician visits and hospitalisation after child placed in OOHC:<br><br>1) Depression<br><br>2) Anxiety<br><br>3) Substance use<br><br>4) Treatment use<br><br>a. Physician visit for a mental illness<br><br>b. Hospitalisation for a mental illness<br><br>c. Psychotropic prescriptions | Poisson regression with inverse probability of treatment weights (IPTW). IPTW based on high-dimensional propensity scores to balance differences between the two cohorts in terms of sociodemographic characteristics and the 500 most common ICD-9-CM codes (in the two years before OOHC/child's death).<br><br>Gamma sensitivity analysis to assess bias due to residual confounding. | Deterministic/ Personal health insurance number/ Not reported |
| Wall-Wieler et al / 2017/ | Women whose oldest child was born 1998-2011 in Manitoba, Canada and who had at least one | 1) Oldest child in OOHC, or | Diagnoses recorded in hospital records and | Multivariable poisson generalised | Probabilistic/ Personal health |

| | | | | | |
|---|---|---|---|---|---|
| Manitoba, Canada [66] | child placed in OOHC aged 2-16yrs (N = 1591)<br><br>Control population:<br>Randomly-selected women whose oldest child born 1998-2011 in Manitoba, Canada and who had no children placed into OOHC, matched on age at child's birth, child's birth year, child's birth order, child's sex, region, income quintile, and developmental disability diagnosis or suicide attempt before birth of child (N = 1591) | 2) No child in OOHC/<br>Primary exposure | physician claims 0-2yrs after OOHC*:<br>1) Depression,<br>2) Anxiety<br>3) Substance use.<br><br>* for control population, date of OOHC is age their matched child entered OOHC. | estimating equations, with an independent correlation matric and log(population size) offset to model rates rather than counts.<br><br>Adjusted for covariates at index date: year, mother's age, child's age, income quintile of neighbourhood, location of neighbourhood and number of children in family. | insurance number/<br>Not reported |
| Wall-Wieler et al /<br>2018/<br>Manitoba, Canada [126] | Women whose oldest child born 1995-2015 in Manitoba, Canada was placed in care within 7 days of birth (N = 776)<br><br>Control population 1:<br>Women whose oldest child born 1995-2015 in Manitoba, Canada received services from CPS within 7 days of birth (but was not placed in care in first year of life) | 1) Oldest child placed in OOHC within 7 days of birth,<br>2) Oldest child received CPS service within 7 days of birth but no OOHC, | Diagnoses recorded in hospital records and physician claims between 7 days to 1 year after birth:<br>1) Depression,<br>2) Anxiety | Multivariable logistic regression<br><br>Adjusted for developmental disability, schizophrenia and suicide attempt any time before birth, depression, anxiety and | Deterministic/<br>Personal health insurance number/<br>Not reported |

| | | | |
|---|---|---|---|
| | (N = 4,270)<br><br>Control population 2:<br>3:1 matched cohort of women whose oldest child born 1995-2015 in Manitoba, Canada was not involved with CPS in the first year of life, matched on maternal age, income quintile, and location (urban/rural) (N= 2,328) | 3) Oldest child had no CPS involvement in 1st year of life/<br>Primary exposure | substance use <2yrs before birth, prenatal visits, child low birth weight, child preterm, and child sex. |

## 3.4 Prevalence of child protection intervention stratified by maternal mental illness and substance misuse status

Seven of the studies demonstrated that rates of CPS reports or entries to state care are far higher among children born to women with maternal mental health problems or substance misuse (Table 3.2).[68–71,124,129,131] In California, USA, the cumulative incidence of being reported to CPS within 12 months of birth was almost eight times higher among children whose mothers had a mental health condition recorded at delivery than for those without (35% vs 4%).[69] Stratified by different types of mental health disorders, 69% of children with a mother diagnosed with a psychotic disorder diagnosis in their delivery record had a report to CPS within 12 months of birth compared with 18% of women with a mood disorder diagnosis and 9% of women with an anxiety disorder diagnosis. In a separate study of the same Californian birth cohort, the incidence of OOHC by 1 year old was 42 times higher among infants exposed to prenatal substance use compared to unexposed infants (29.9% vs 0.7% by age 1), identified via diagnoses recorded at the birth admission.[131] Stratified by substance type, infants exposed to prenatal cocaine use had the highest prevalence of OOHC and those exposed to cannabis had the lowest. In Western Australia, children born to mothers with a prior mental health inpatient or outpatient contact had four-fold higher incidence of a child maltreatment allegation (9.2% vs 2.3%) and five-fold higher incidence of a substantiated child maltreatment allegation (1.0% vs 5.5%), over childhood, compared to other children.[70,124] Among children born in Western Australia to mothers with a prior substance use-related hospital contact, the incidence of having a substantiated allegation was 8 times higher over childhood compared to other children (1.2% vs 8.3%).[124] Stratified by different types of mental health disorders, incidence of having a child maltreatment allegations made was highest for children exposed to maternal personality disorder diagnosis (16%) or substance-related mental health diagnosis (16%) and lowest for maternal depression or anxiety diagnosis (6%).[70] In Denmark, the cumulative incidence of entry into care over childhood was seven times higher among children born to women with a pre-birth schizophrenia diagnosis (35%), four times higher with a pre-birth bipolar disorder diagnosis (18%), or three times higher with a pre-birth unipolar depression diagnosis (14%), compared to children born to women

without these diagnoses (5%).[71] In an older Danish study, the incidence of entry to OOHC before the age of 3 years old was 10 times higher among children whose mother had a mental health -related hospitalisation before birth compared to other children (15.7% vs 1.6%).[129] Finally, in Manitoba, Canada, the incidence of OOHC within 7 days of birth was 13 times higher among children born to women with schizophrenia (11.4% vs 0.9%), 10 times higher with substance misuse (6.9% vs 0.7%), and two times higher with mood or anxiety disorders (1.4% vs 0.7%), compared to unexposed children.[68]

Twelve studies examined the relationship between maternal mental health or substance use and CPS outcomes using multivariable models, adjusted for other child, mother and family-level characteristics known to be predictive of child maltreatment.[32,68–70,122–125,127–129,131] Indicators of maternal mental health problems and substance misuse were consistently found to be positively associated with CPS allegation and child entry into care. There is some evidence to suggest that the magnitude of these associations vary by type of mental health diagnosis or substance used,[69,70,123] as well as by time.[129] Across a number of settings, the association between maternal substance use and CPS involvement was far higher than for maternal mental health problems.[68,70,125,131] For both maternal substance use and mental health problems, associations were typically highest among women with these problems recorded during or close to pregnancy.[68–70,128,131]

## 3.5 Prevalence of maternal mental health problems and substance misuse where children enter care

### 3.5.1 Pre-existing maternal health needs

Among five of the studies investigating OOHC, [68,122,123,127,129] the prevalence of maternal health needs recorded prior to OOHC ranged from 26.8% to 65.8% for mental health problems and 15.5% to 61.60% for maternal substance use. These figures were consistently higher than among the studies' control populations (typically women with the same inclusion/exclusion criteria but with no child placed into care – see Table 3.2). Another study, from Wales, captured maternal health need among those involved in court proceedings concerning placement of an infant under 12 months old into care ('care proceedings').[84] These were compared to a matched control group of women giving

birth whose child did not enter care proceedings. Among women with infants (< 1 year old) involved in care proceedings, 51.8% (vs 18.9%) had a mental health-related GP contact or hospitalisation in the 2 years before birth and 18.5% (vs 1.7%) had a substance-related GP contact or hospitalisation in the 2 years before birth. These figures highlight the high rates of mental health and substance misuse among women whose children enter care compared to the general population of mothers, leading some English local authorities to integrate adult mental health services into their child and family services to better respond to these health needs.[132,133]

### 3.5.2 Subsequent maternal health needs

Data linkages between CPS records and parental healthcare data have also enabled research into maternal health outcomes following having a child placed into care, though just four studies in my systematic review focussed on this direction of association (Table 3.3). All four studies were conducted in Manitoba, Canada, and three focussed on subsequent risk of receiving diagnoses for depression, anxiety, or substance use among women who had a child placed into care, each using different control populations.[66,67,126] Among women whose children entered care within seven days of birth, 30.8% had a record of postpartum depression or anxiety compared to 19.6% of mothers who received CPS services (but no OOHC) in the first year after birth and 13.8% of mothers who did not receive CPS services in the first year after birth.[126] After adjustment for maternal mental health indicators before birth and child-level risk factors, the odds of postpartum depression or anxiety was 1.31 (95% CI: 1.08, 1.59) time higher compared to mothers who received CPS services and 2.13 (95% CI: 1.67, 2.73) times higher compared to mothers who did not receive CPS services. Results were similar in the other two studies. One focussed on depression, anxiety and substance use and mental health -related health care contacts observed over follow-up among women whose oldest child entered OOHC compared to women whose oldest child died.[67] There was evidence that the rates of subsequent depression diagnosis (1.90, 95% CI: 1.82-1.98), anxiety diagnosis (2.51, 95% CI: 2.40-2.63), substance use diagnosis(8.54, 95% CI: 7.49-9.74), physician visits for a mental illness (3.01, 95% CI: 2.91-3.12) and psychotropic prescription (4.95, 95% CI:4.85-5.06) were higher among women whose child entered care than women whose child died. However, there was insufficient evidence that the

rate of subsequent hospitalisation for a mental illness differed between the two groups (1.03, 95% CI:0.90-1.19). The other study focussed on the same sets of outcomes (depression, anxiety and substance use and mental health -related health care contacts) but observed over the two years following entry into out-of-home care among women with a child who entered care between 2-16 years old.[66] The comparison group was comprised of a matched group of women whose oldest child did not enter care. There was evidence that the rate of depression diagnosis (2.38, 95% CI: 2.07-2.74), anxiety diagnosis (3.55, 95% CI: 2.88-4.38), substance use diagnosis(5.95, 95% CI: 4.67-7.56), physician visits for a mental illness (3.66, 95% CI: 3.02-4.43) and psychotropic prescriptions (5.86, 95% CI:4.49-7.63) were higher among women whose child entered care than women whose children never entered care. There was also evidence that the rate of subsequent hospitalisation for a mental illness was higher among women whose children entered care aged 2-16 than women whose children never entered care (10.55, 95% CI:4.84-23.07). The fourth study focussed on risk of suicide among women who had a child placed into care.[63] The adjusted rate of attempted suicide over follow-up was 2.15 (95% CI: 1.40-3.30) times higher among women whose oldest child entered care compared to their biological sisters whose child did not enter care and 2.82 (95% CI: 2.03-3.92) times higher than other mothers who received CPS services but no OOHC. Similarly, the adjusted rate of death due to suicide over the same follow up period was 4.46 (95% CI: 1.39-14.33) times higher and 3.45 (95% CI: 1.61-7.40) times higher, respectively.[63]

Though each of these studies adjusted for other risk-factors for the chosen outcomes (such as socioeconomic status, maternal age, maternal mental health/substance use before birth, child age), it is possible that there were unmeasured confounders that contributed to both the child being placed into state care and the subsequent mental health, substance use and suicide-related outcomes. For example, domestic violence, history of maternal maltreatment in childhood and Indigenous status were not available in the data used in these studies while maternal education had extremely high levels of missingness rendering it unusable. However, these studies employed a number of methods to understand the impact of residual confounding on their findings including Gamma sensitivity analyses and using biological sisters as a comparator (thereby accounting for Indigenous status). [63,67]

## 3.6 Reporting biases

There are several biases that can affect studies using linked administrative data sets.[134,135] These include selection bias due to sample selection criteria or linkage error, and information bias arising due to misclassification of exposures/outcomes, missing data, residual confounding and surveillance bias. The studies included in this review were generally poor at discussing many of these potential biases (Table 3.4)

**Table 3.4: Reporting of linkage error and other potential biases**

| Biases discussed in study methods/limitations | N | % |
|---|---|---|
| Selection bias: linkage error (missed matches) | 1 | 5.6% |
| Selection bias: complete case analyses | 0 | 0.0% |
| Information bias: misclassification error | 16 | 88.9% |
| Information bias: unmeasured confounding* | 15 | 88.2% |
| Information bias: missing data | 0 | 0.0% |
| Information bias: surveillance bias | 6 | 33.3% |
| Sensitivity analyses | 3 | 16.7% |
| Generalisability of findings to population under study/other settings | 8 | 44.4% |

* Percentage out of 17 studies as one study was descriptive only and therefore did not consider confounding.

None of the studies in my review mentioned the potential impact of selection bias, despite all studies applying inclusion/exclusion criteria (Table 3.4). Selection bias can also be introduced by linkage error (i.e., missed matches and false matches). Just three studies reported linkage rates between CPS cohorts and health data sets, which ranged from 91% to 92%.[69,84,131] Though each of these three studies had a very small proportion of missed matches, only Griffith's et al discussed the potential of linkage error to impact on

findings, specifically highlighting mothers with infants in proceedings who were excluded from the analysis due to failure to link were slightly older than those included but there was no evidence that they differed in terms of deprivation measured at the residential area level.[84] This is an important limitation as missed matches can result in a loss of generalisability to the population of interest due to selection bias if those with missed matches are systematically different to those that correctly linked (i.e., differential linkage error).[134] On average, the studies included in my review were very poor at describing linkage methods and rates (Table 3.1), making it difficult for readers to appraise the findings. To address this, in 2017 a group of researchers and data providers with expertise in linking data developed the GUidance for Information about Linking Data (GUILD) checklist, which outlines the information that researchers should include when reporting studies using linked data, to improve the validity and clarity of the analyses.[136]

The most common bias discussed among the 18 studies was misclassification bias. Misclassification bias can occur when an individual is incorrectly categorised (e.g.,mistakenly classified as 'exposed' when 'unexposed'), which can alter the association under study and result in erroneous findings. Studies included in this review largely focussed on misclassification of the exposure, namely the limitations of identifying maternal mental health problems and substance misuse within administrative health records. For example, while all studies used hospitalisation records, several did not have access to data from primary care or prescriptions and therefore likely identified only the most severe cases of maternal mental health problems and substance misuse. Many studies noted that the relationship between maternal mental health problems and/or substance misuse and child protection outcomes for women with less severe health need may be weaker than observed. In addition, administrative health data would not capture women who did not seek treatment or who did not have their diagnosis recorded within the period that researchers were focussing on. For example, several studies only included maternal diagnoses recorded before a child's birth. Finally, none of the studies described the impact of linkage error, specifically of false matches, on misclassification of child protection outcomes.

Also common was discussion of unmeasured confounding. Several studies noted that important risk-factors for child maltreatment and child protection intervention such as

intimate partner violence, quality of parent-child or parent-parent relationships, and family stressors such as housing status were not routinely captured in health or child protection data systems. To assess the impact of unmeasured confounding on their study findings, two studies performed sensitivity analyses.[63,67] One study used a Gamma sensitivity analysis to test robustness of findings to residual confounding.[64] The other used a secondary analysis of women who experienced the exposure of interest, comparing them with an 'unexposed' biological sister to assess the impact of adjustment for stable family characteristics including Indigenous status on the main findings.[63]

Six studies in my review discussed the possibility of surveillance bias (also known as ascertainment bias) inflating reports to CPS among women with mental health problems or substance misuse who are in contact with healthcare service (compared to other women who experience these problems but who are not in contact with healthcare).[67–69,125,126,131] A recent study looking at surveillance bias in CPS reporting among children in the United States who accessed child and adolescent mental health services or social services found evidence that surveillance bias existed but had a very small effect.[137] Therefore, although it cannot be ruled out in any of the included studies, the best available evidence suggests that surveillance bias is not a major contributing factor to the observed associations. Two studies included in my review even suggested that the use of linked administrative data reduced the risk of surveillance bias, "as the data were collected independently of the research hypothesis".[67,126]

Finally, none of the studies described the limitations of missing data or of performing a complete case analysis on their findings and very few provided information about how missing data were handled. For example, in one study over 2500 (~4%) of eligible mothers were excluded due to missing data in maternal age, gestational age and neighbourhood yet no analysis was given to compare differences in non-missing variables between those who were and were not excluded.[68] If the women excluded due to missing data systematically differ from those included then this could introduce selection bias, which could impact the generalisability of the findings to the population of interest. More generally, complete case analyses may give biased results (in an unknown direction) when the probability of being a complete case (i.e., having no missing data) depends on the outcome being modelled.[138]

## 3.7 Conclusion

Linked administrative health and child protection data is feasible in many settings, particularly those with a single unique person identifier collected across government departments and public services. While it is possible that my search did not retrieve all relevant published studies, my review found that research using these types of linked data consistently shows a high prevalence of mental health problems and substance misuse among women whose children enter care, compared to other mothers. Similarly, these studies show that women who experience mental health problems and substance misuse are at a higher risk of having children placed into care, even after accounting for other risk factors for entry into care. It also reveals the enduring nature of these problems, with emerging evidence that having a child placed into care may be causally associated with poorer maternal health outcomes later in life including suicide. However, linked whole-population administrative data are not without their limitations, for example, administrative data collected by services and governments are typically not intended for use in research and therefore have varying data quality and may be missing important variables such as information on intimate partner violence or quality of caregiving. In addition, linkage error caused by missed matches and false matches may introduce systematic differences between study participants who link and the population of interest and misclassification bias, respectively.[134] My review found that few studies using linked administrative health and child protection data have considered or attempted to overcome these common biases. Nevertheless, using linked administrative data on whole populations has the potential to mitigate many of the common issues affecting survey studies and traditional cohort studies such as recall bias, selection bias and attrition over time.[78,130]

The remainder of my thesis focusses on the evaluation and analyses of a new person-level data linkage between South London and Maudsley NHS Foundation Trust patient records, stored in the Clinical Research Interactive Search (CRIS) database, and family court data from the Children and Family Court Advisory and Support Service (Cafcass) on women with children subject to care proceedings (the 'CRIS-Cafcass' linkage).

# Chapter 4: Introduction to the data sets and data linkage

**Chapter overview**

In this chapter, I described a new linkage between family court data on women with children in care proceedings and mental health and substance misuse service data from the South London and Maudsley NHS Foundation Trust (SLaM), which serves the populations of Croydon, Lambeth, Lewisham, and Southwark. This work addressed objective 3 of this thesis:

*To assess the accuracy of a new linkage between family court data and mental health service records for women involved in care proceedings in South London, 2007-2019.*

A paper based on this chapter was published by the International Journal of Population Data Science in February 2021:

Pearson RJ, Jewell A, Wijlaars LPMM, et al. Linking data on women in public family law court proceedings concerning their children to mental health service records in South London. (2021) International Journal of Population Data Science, 6(1). doi: 10.23889/ijpds.v6i1.1385

## 4.1 Background

### 4.1.1 Rationale for data linkage

Each year, approximately 16,000-17,000 mothers in England are involved in public family law proceedings initiated under section 31 of the Children Act 1989 (commonly referred to as 'care proceedings').[75] Care proceedings concern whether or not a child should be placed into local authority care to safeguard them from maltreatment due to the care they receive. Despite England's declining birth rate in recent years,[139] both the number of women involved in care proceedings and the number of children entering care has risen considerably over the past decade.[2,75]

Previous research has highlighted the need for population-level data sets with information on child protection outcomes as well as maternal health in order to inform evidence-based policy and practice.[21,78] In the absence of robust empirical evidence regarding prevalence of, or the detail of health need (specific to this population), services

may be limited in their ability to treat mental health and substance misuse and to prevent the reception of children into state care.

Traditional prospective cohort studies and surveys, which typically include only a small sample of the general population, are not well suited for research into the associations between parental health service use and child entry into care as very few (~3.3%) children in England ever enter care.[28] In addition, families at greater risk of child protection are likely hard to engage and retain in research that relies upon self-reported measures.[56,57,140] To overcome these barriers, researchers in Australia, Canada, the US and Wales, among others, have linked data from large-scale administrative datasets, based on full-service populations — for example, child protection records and healthcare records — to generate large amounts of quantitative evidence on the association between maternal health, child neglect and abuse, and child placement in state care.[68,69,82] In England, similarly linked data resources are urgently needed to identify opportunities for an improved response to maternal mental health and substance misuse need through the family court, children's social care, and health.[3,78]

To address the lack of suitable data for research, in November 2019, a data linkage was established, combining mental health and substance misuse service user records from the South London and Maudsley NHS Foundation Trust (SLaM) with records from the Children and Family Court Advisory and Support Service (Cafcass) on women with children involved in care proceedings. The aim of this study was to describe the linkage rates among women involved in care proceedings in the SLaM catchment area (Croydon, Lambeth, Lewisham, and Southwark) and to evaluate the quality of the linkage.

### 4.1.2 Data governance and ethical considerations

The linkage described in this chapter forms part of a larger project, funded by the Nuffield Foundation, to establish new linkages between administrative healthcare data and Cafcass data on women with children involved in care proceedings (hereafter referred to as the 'main project').[141] Several permissions were required for this linkage. Figure 4.1 details a timeline of the permissions that I helped to secure and/or maintain.

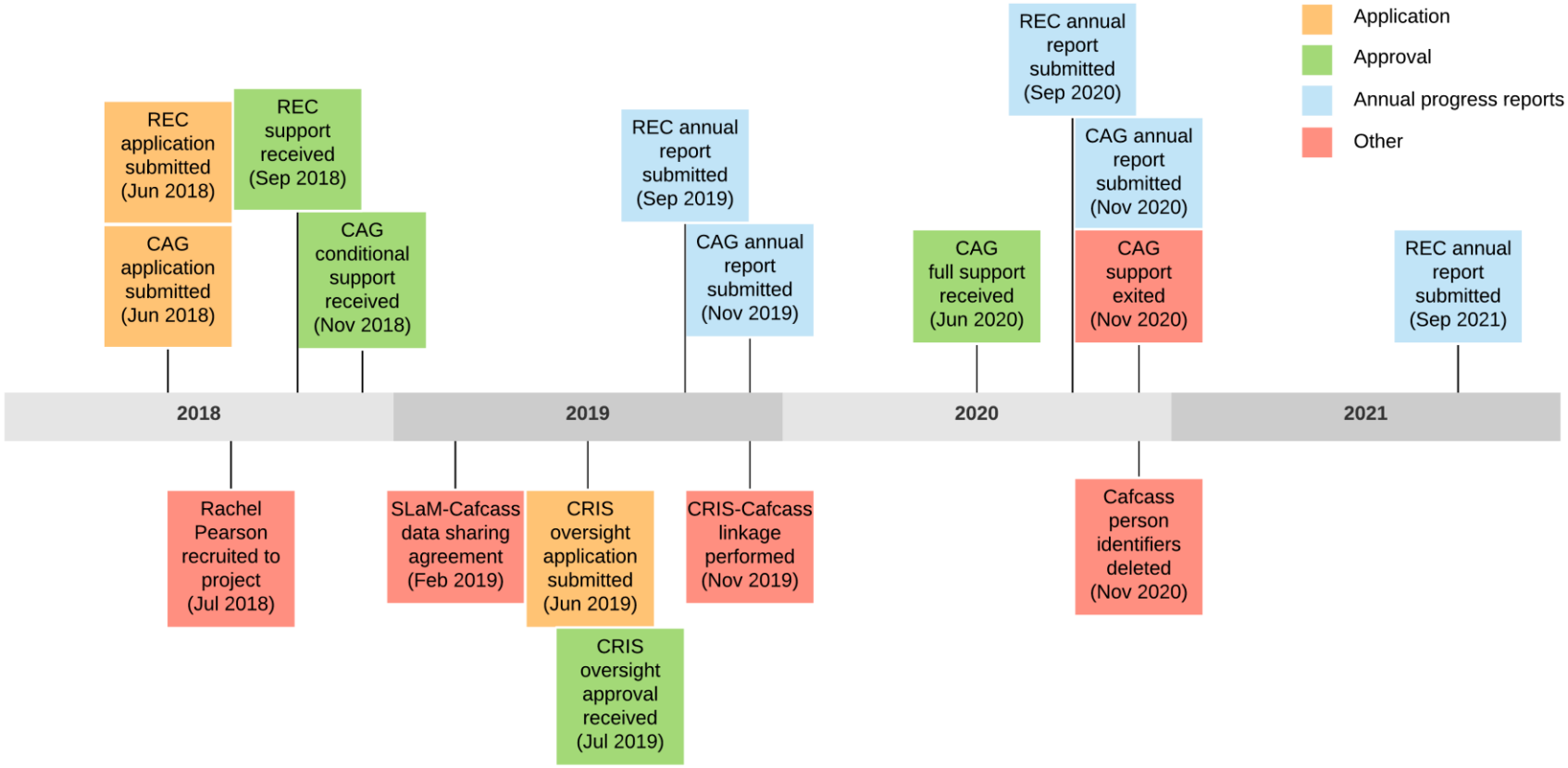
First, as the linkage involved data from an NHS trust, NHS Research Ethics Committee approval was required. Though the Clinical Research Interactive Search (CRIS) database,

which captures all SLaM service records,[142,143] already has REC approval for secondary data analysis (reference: 18/SC/0372), further ethical approval was required to link Cafcass data to CRIS. I joined the project in July 2018 and supported colleagues in UCL and SLaM in submitting an NHS REC application to link these data in June 2018, with approval granted in September 2018 (reference: 18/SC/0363). Afterwards, I submitted annual progress reports to the NHS REC to maintain approval.

Second, NHS Confidentiality Advisory Group (CAG) approval was required to process NHS person identifiers (e.g., names, addresses, date of birth etc.) without patient consent. The project team applied to CAG in June 2018 and received conditional support in November 2018 (reference: 18/CAG/0018). I submitted annual progress reports to the NHS CAG each year to ensure CAG support continued until no longer needed. Following review of the first annual progress report, full CAG support was granted in June 2020. I confirmed to the NHS CAG that support could be exited after Cafcass person identifiers held by SLaM had been deleted in November 2020, 12 months after the linkage had been completed.

Third, permission was required from Cafcass and SLaM (the 'data controllers') to establish this linkage. The project team applied to the Cafcass Research Governance Committee in November 2016 to establish this linkage, with support received in December 2016.[144] Similarly, in May 2018, the project team secured Caldicott approval and support for the linkage from the SLaM Caldicott Guardian. In February 2019, following REC and CAG approval, Cafcass and SLaM signed an information processing agreement enabling Cafcass data to flow from Cafcass to SLaM for linkage. This agreement enabled SLaM to receive Cafcass data to establish the CRIS-Cafcass linkage, and for the linked data to be analysed within the CRIS secure research environment. Finally, in June 2019 I applied to register the main project with the CRIS oversight committee, who review and approve access to CRIS data for research, with approval granted in July 2019 (reference: 19-050).

**Figure 4.1: Timeline of approvals (July 2018 to October 2021)**



### 4.1.3 Public and patient engagement

Previous research around public perceptions of sharing and linking health data for research has shown that, while there is generally support from the public to link these types of data for research in the public benefit, researchers should engage with patients and the public to raise awareness of new data linkages and provide opportunities for people to feedback on research and linkage plans.[145] Though this PhD project broached sensitive topics, previous research on interviewing parents subject to child protection intervention has shown that most were glad to have been involved in research.[140] To overcome difficulties with recruiting participants for public and patient engagement sessions, I connected with organisations that work closely with women with experience of care proceedings and/or mental health and substance misuse services.[56]

In September 2019, I was awarded a grant by the University College London Hospitals Biomedical Research Centre to hold a focus group with women and practitioners from one of the Pause project's South London programmes. Pause provide a programme of support to women who have had multiple children removed from their care via the family court and this programme currently operates in over 30 English local authorities.[146] Prior to the start of this PhD project, in March 2018, the wider project team consulted the Maudsley BRC Data Linkage Service User and Carer Advisory Group with the initial research proposal to establish this research database.[147] The group comprises people with lived experience of mental illness, and their carers, all of whom have an interest in mental health research involving data linkage. The data linkage was also discussed in February 2019 with the Addictions Service User Research Group(SURG), a local group of drug and alcohol service users who meet regularly and provide advice and support to those undertaking research relating to addiction.[148] SURG is organised jointly by the King's College London Addictions Department and the Aurora project in Lambeth

Across each of these sessions, attendees felt that the new CRIS-Cafcass data linkage was important and necessary to evidence the health needs of women involved in care proceedings, to inform work to provide better interventions and support to this population. In particular, attendees noted that using linked administrative data removed the need for women to recount events around their children being placed into care. These sessions also highlighted limitations in the research and helped in the development of future research

involving this linkage, such as a new mixed-methods PhD project that will attempt to better understand the barriers of accessing mental health services among women involved in care proceedings. These sessions also identified maternal mortality as a key area of importance to research among this population.

## 4.2 Methods

### 4.2.1 Data

*Public family court case records*

Where local authorities seek to place a child into care under a court order, they must submit an application to the family court (i.e., an application for care proceedings).[25] The application is also sent to Cafcass (the Children and Family Court Advisory and Support Service), which is an independent non-departmental public body sponsored by the Ministry of Justice (MoJ).[149] Cafcass work in tandem, with a solicitor, to represent the child in care proceedings and to advise the court on the best interests of the child. At the outset of every set of care proceedings, a Cafcass children's guardian is appointed by the court and oversees the case until the conclusion of care proceedings. These specialist social workers work independently of the parents and the local authority and therefore, play a critical role in advising the court on whether court orders are needed, as well as the care plan for the child.

Through its case management system, Cafcass captures information on all relevant adults and children involved in a public family law application. This includes demographic information such as age, gender, and ethnicity, as well as case information such as who was involved in the case, key case dates, final legal orders made, and parent-child relationships (Figure 4.2). All individuals in the Cafcass data are assigned a unique person identifier (a Cafcass person ID). Cafcass also capture information on the relationships between individuals involved in a set of proceedings. This enables researchers to follow individuals as well as family groups over time, if they become involved in a subsequent set of care proceedings. Cafcass data is available from April 2007 and therefore may capture only a portion of an individual's involvement in care proceedings over their life-course. At least 90% of care proceedings involve a birth mother.[75]

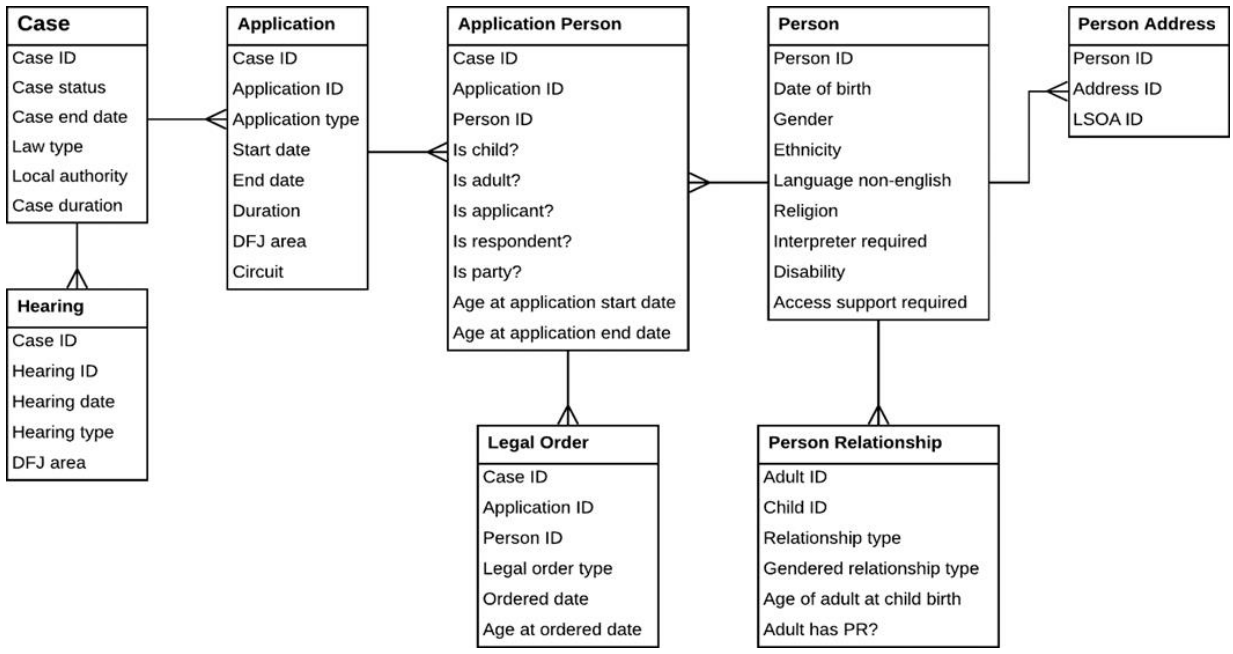
The Cafcass data includes demographic information such as age, gender, and ethnicity, as well as case information such as who was involved in the case and key dates. It also contains information on final legal orders made, though these are missing in approximately 4% of cases.[75] Care proceedings can have a number of final legal outcomes, with only a small proportion being dismissed or given a ruling that no order should be made (an 'Order of No Order'). Over one-third of children subject to proceedings enter care under a Care Order, which grants parental responsibility to the child's local authority. One-sixth are given Placement Orders or Adoption Orders, which enable children to be placed with registered adopters. Around 30% of children subject to care proceedings are diverted from local authority care via the use of certain private family law orders (Special Guardianship Orders and Child Arrangement Orders) to place them with other family members or family friends. The remainder receive Supervision Orders which allow the local authority to 'advise, assist and befriend' a child that remains under parental care to promote its health and wellbeing (UK Government, 1989).[20] Children may also receive interim legal orders to place them into out-of-home care while care proceedings are ongoing, though Cafcass do not routinely record these orders.[2] These include Interim Care Orders (i.e., a Care Order that is valid for

only a fixed period of time) as well as Emergency Protection Orders, which are used to placed children at immediate risk of harm into out-of-home care and last for up to eight days.

*The South London and Maudsley NHS Foundation Trust patient register*

In England, care for mental health problems and substance misuse, including psychological therapies and medication, is typically provided by general practitioners (GPs) in the first instance. GPs and other health or social care practitioners can also refer patients who do not respond to treatment, or who require specialist mental health care that cannot be provided by a GP, to secondary and tertiary health services provided by an NHS mental health trust (such as SLaM). In addition, people experiencing common mental health disorders such as anxiety disorders and depression can self-refer, or, again, be referred by a health or social care practitioner, to community-based services providing psychological therapies (such as cognitive behavioural therapy), known as IAPT (Improving Access to Psychological

**Figure 4.2: Cafcass case management data structure**



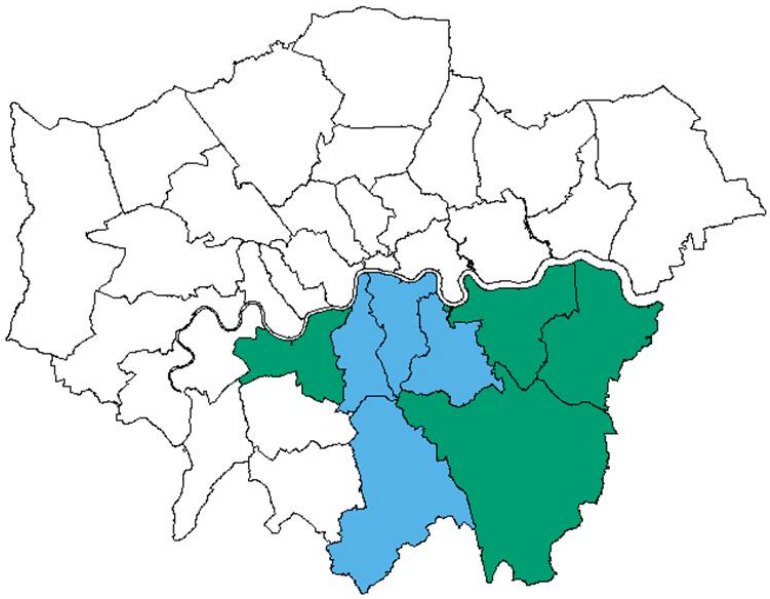

Source: Bedston, Pearson et al, 2020. Figure A1. (https://doi.org/10.23889/ijpds.v5i1.1159)

Therapies) services.

SLaM is the sole provider of NHS secondary and tertiary mental health services in its four constituent local authorities (Croydon, Lambeth, Lewisham and Southwark, Figure 4.3), which, combined, have an estimated population of 1.3 million.[142,150] For much of the study period, SLaM was also the sole provider of substance misuse services to these four local authorities (Table A 4.1). SLaM additionally delivers some services, mostly for substance misuse, to four neighbouring local authorities (Bexley, Bromley, Greenwich, and Wandsworth) and provides several specialist national services including a 12-bed mother and baby unit for women experiencing severe perinatal mental health problems.

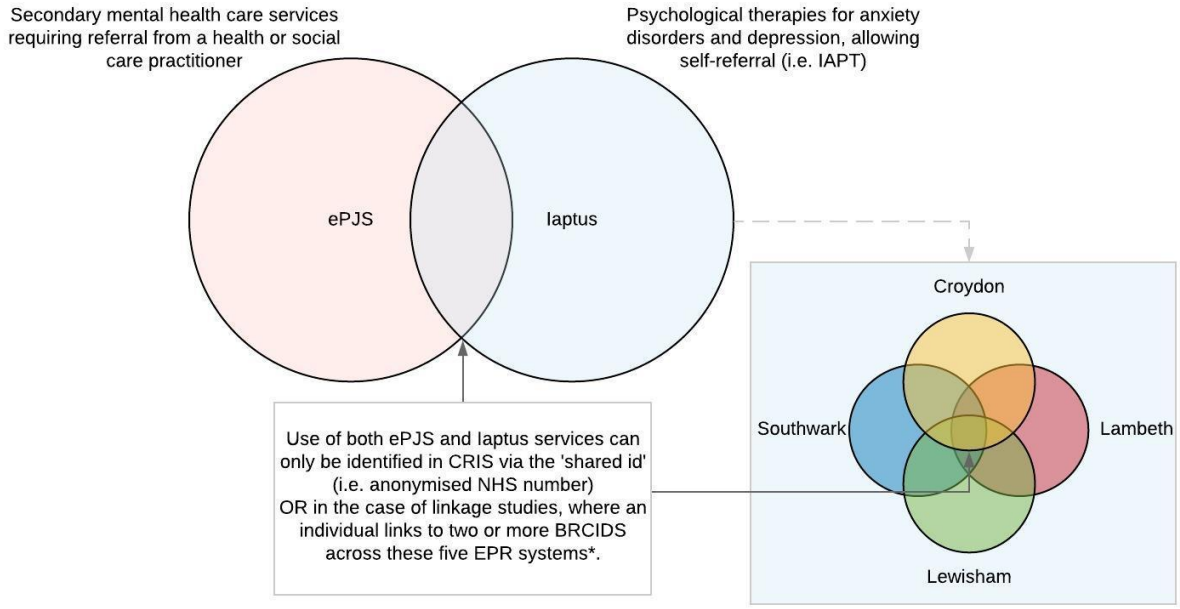
Most SLaM services use a bespoke electronic patient record (EPR) system, the electronic

**Figure 4.3: The SLaM local authorities (blue) and neighbouring local authorities (green)**



patient journey system (ePJS), to record information on service users. However, SLaM also operates IAPT in Croydon, Lambeth, Lewisham, and Southwark, which use the Iaptus EPR system. Overall, SLaM hosts five EPR systems: ePJS, Iaptus Southwark, Iaptus Croydon, Iaptus Lambeth, and Iaptus Lewisham, though service user information is not shared between them (Figure 4.4). To facilitate research, SLaM established the Clinical Record Interactive Search (CRIS) database in 2007, which contains anonymised records from each of these five EPR systems .[142,143]

**Figure 4.4: The five electronic patient record systems that feed into the CRIS database**




* ePJS, Iaptus Croydon, Iaptus Lambeth, Iaptus Lewisham, and Iaptus Southwark.

In CRIS, each mental health service user, within each of the EPR systems, is assigned a pseudonymised unique identifier (the 'BRCID'), allowing researchers to link an individual's data longitudinally. This means that an individual using IAPT and non-IAPT SLaM services can have up to 5 BRCIDs, however, both the Iaptus and ePJS systems capture the service user's NHS number, where available, which is anonymised in CRIS (the 'shared id') and can be used to identify and link information on individuals between the EPR systems (Figure 4.4). In addition to structured fields (e.g., dates, diagnoses and medications), CRIS includes de-identified, unstructured, free-text fields (such as clinical progress notes, discharge reports and other correspondence).[24] This enables researchers to utilise the full electronic health record using natural language processing applications or manual review.[142]

### 4.2.2 Linkage cohort

The linkage cohort comprised 5463 women in the Cafcass data who were identified as the mother of a child subject to care proceedings that began or ended between April 2007 and

March 2019 and were brought by one of eight South London local authorities (Bexley, Bromley, Croydon, Greenwich, Lambeth, Lewisham, Southwark, and Wandsworth).

While I have focussed on Croydon, Lambeth, Lewisham, Southwark, which are served by SLaM, four neighbouring boroughs which SLaM provides some services to were included in the linkage to increase usefulness of these linked data for future research.

### 4.2.3 Study cohort

For this study and the remainder of this PhD, I focussed on 3226 (59.4%) women in the linkage cohort who were involved in care proceedings in the SLaM catchment (Croydon, Lambeth, Lewisham, and Southwark) between April 2007 and March 2019 (the 'study cohort').

### 4.2.4 Linkage methods

#### *The linkage algorithm*

The Cafcass and CRIS databases do not share a common unique identifier, therefore, person identifiers were used for record linkage. These included forenames, surnames, aliases, dates of birth and address postcode history (up to three postcodes in Cafcass and up to five in CRIS). The CRIS and Cafcass person identifiers were linked in November 2019 by the SLaM Clinical Data Linkage Service (CDLS), which acts as a Trusted Third Party for SLaM, receiving person identifiers from external data providers to carry out linkages within the SLaM firewall. The CDLS used a deterministic linkage algorithm with eight matching rules, where rule 1 was the strictest and rule 8 was the most lenient (Box 4.1). Each Cafcass person ID could match to multiple BRCIDs and vice versa.

**Box 4.1: The linkage algorithm (rules 1 to 8)**

1. Exact or partial* match on forename and surname. Exact match on full date of birth, and at least one postcode.
2. Exact match on Soundex code for forename and surname [28]. Exact match on date of birth and at least one postcode.
3. Exact or partial match on forename. Exact match on date of birth, and at least one postcode.
4. Exact or partial match on surname. Exact match on date of birth, and at least one postcode.
5. Exact or partial match on forename and surname. Exact match on at least one postcode.
6. Exact or partial match on forename and surname. Exact match on date of birth.
7. Exact match on Soundex code for forename and surname. Exact match on date of birth.
8. Exact match on the first character of the forename, characters 1-3 of the surname, and on full date of birth.

* Forenames and surnames in Cafcass and CRIS were split in two (e.g., Forename = 'Mary-Jane' would become Forename 1 = 'Mary' and Forename 2 = 'Jane'). Each of the split names were compared pairwise for all four pair combinations. In addition, the unsplit forenames and surnames were compared to any recorded

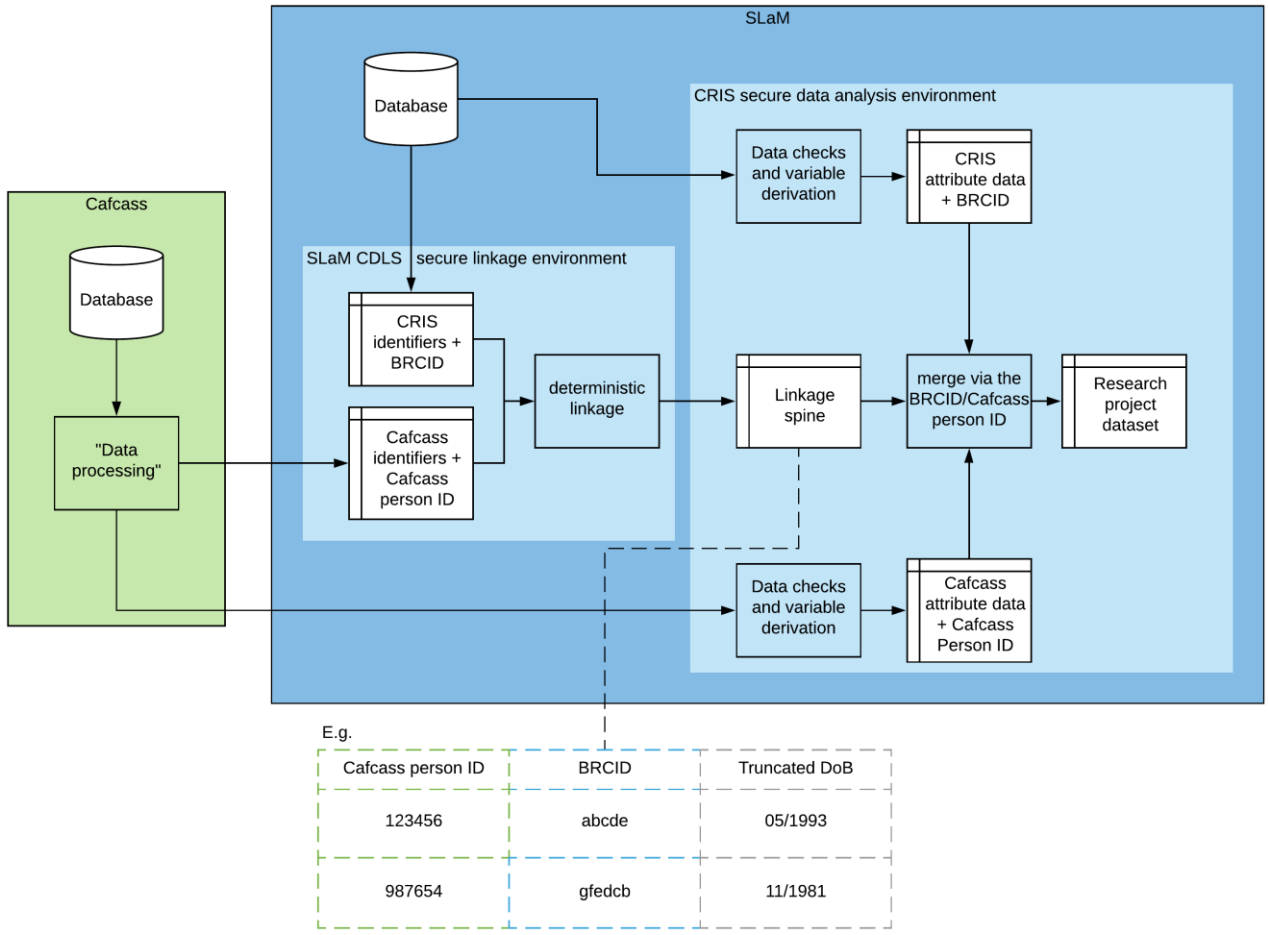
*Employing the separation principle*

To reduce the risks of re-identification, individual level data on SLaM service use and about care proceedings (i.e., attribute data) were held separately from personal identifier data (i.e., name, date of birth etc) at all times (Figure 4.5). This is known as the separation principle.[151] For all eight steps of linkage, CRIS person identifiers were merged onto the 5643 sets of Cafcass person identifiers. Linkage was carried out with replacement (i.e., many-to-many matches were allowed within and across the eight linkage steps). Once the linkage was complete, the CDLS removed all person identifier records that did not link. The pseudonymised linkage spine was then created by removing all remaining CRIS and Cafcass person identifiers, except for date of birth, which was truncated to month and year, to leave only Cafcass person IDs and their corresponding BRCID(s). The linkage spine was then transferred into the CRIS data analysis environment where CRIS and Cafcass attribute data (i.e., mental health/substance misuse service records and Cafcass case information) were

merged via the pseudonymised IDs (i.e., Cafcass person IDs and BRCIDS, respectively) to form the CRIS-Cafcass research data set.

Where Cafcass Person IDs linked to a BRCID with an associated shared id (an anonymised NHS number) present, I linked in any additional ePJS and Iaptus BRCIDs associated with the shared id that had not already linked to the Cafcass Person ID.

**Figure 4.5: Data flow diagram for the CRIS-Cafcass data linkage**




## 4.2.5 Assessing the quality of the linkage

### *Identifying false matches and duplicates*

There are no reference or gold-standard data (i.e., data where match status is known) to compare these linkage results to estimate missed and false match rates among the study

cohort. Instead, I performed a manual review using the pseudonymised linked data set in the CRIS secure data analysis environment to identify false matches. I carried out manual review for three scenarios including: 1) where a Cafcass Person ID linked to two or more pseudonymised BRCIDs within the same service, 2) where two or more Cafcass Person IDs linked to the same BRCID within any SLaM EPR system, and 3) where a Cafcass person id linked to a BRCID via step 8 of the linkage algorithm (selected due to the leniency of this matching rule). I reviewed de-identified clinical notes (i.e., clinician free-text fields) and SLaM child risk screen forms (forms administered to adult patients to record information on their children, if any), and pseudonymised Cafcass data on case information and children involved in proceedings to compare information held in CRIS and Cafcass about the number and dates of birth of children. Where information from CRIS and Cafcass were in disagreement, I considered the match to be false.

After removing false matches and performing de-duplication, I undertook further manual review of de-identified clinical notes and correspondence text for a random sample of 100 BRCIDS that linked at any step of the linkage algorithm to look for positive mentions of care proceedings. These results are available in the chapter appendix (page 254).

### 4.2.6 Statistical analysis

#### *Estimating prevalence of mental health service use in South London*

I used the proportion of women from the study cohort who linked to a SLaM patient record to estimate the true proportion of women involved in care proceedings in the SLaM catchment who ever accessed SLaM services. I estimated a plausible range, including a base case (i.e., the midpoint of the plausible range), by assuming that a proportion of unlinked records were missed matches. These formulae were developed to produce conservative estimates of the prevalence of SLaM service use among women involved in care proceedings in the SLaM catchment by taking into account that fact that women with missing date of birth or postcode history in the Cafcass data had a lower chance of linking, if they indeed had a SLaM record, than women with these variables non-missing (Table 4.1). This method was based upon previously reported methods.[152]

**Table 4.1: Plausible values for prevalence of mental health service use in Croydon, Lambeth, Lewisham, and Southwark**

| | Percentage of unlinked records assumed to be missed matches by category of missingness among date of birth and postcode | | |
|---|---|---|---|
| | Missing date of birth and postcode (A) | Missing date of birth but at least one postcode recorded (B) | Non-missing date of birth and at least one postcode recorded (C) |
| Lower limit | 10% | 10% | 10% |
| Base case | 50% | 35% | 25% |
| Upper limit | 90% | 60% | 40% |

Example formula (Base Case):

$$\frac{0.5 * (\text{unlinked in A}) + 0.35 * (\text{unlinked in B}) + 0.25 * (\text{unlinked in C}) + \text{linked}}{\#\text{ of unlinked} + \#\text{ of linked}}$$

### *Comparing women in Cafcass who did and did not link*

I compared sociodemographic and Cafcass case characteristics between women in the study cohort who linked to a BRCID and women who did not link.

Using pseudonymised Cafcass data for my study cohort, I produced descriptive statistics for measures of women's sociodemographic characteristics and characteristics of their care proceedings. These variables are defined in There are several possible legal order outcomes for children in care proceedings. Previous research provides a framework for grouping these legal orders by their likely outcomes for children.[46,153] These groupings include: remaining or returning home (case dismissed or Order of No Order), supervision at home (Family Assistance Order or Supervision Order), placed in out-of-home care (Care Order or Secure Accommodation Order), placed with extended family (Special Guardianship Orders or Child Arrangements Orders (known as Residence Order prior to April 2014)), and placed for adoption (Placement Order or Adoption Order).[20,154]

Table 4.2 and were derived from all sets of care proceedings that women were involved in over the study period (April 2007 to March 2019), recorded in Cafcass. These measures included: age at birth of oldest child recorded in Cafcass, age at the beginning of the index (i.e., first recorded over the study period) set of care proceedings, ethnic group (White, Black or Black British, Asian or Asian British, Mixed, Other, Missing), number of children recorded in Cafcass linked to the mother's record, age of youngest child involved in proceedings, whether or not the child(ren)'s father was ever party to proceedings, Indices of Multiple Deprivation (IMD) 2010 quintiles associated with her address at the index set of proceedings,[100] the year (April-March) that their index set of proceedings began, final legal orders made in any set of proceedings, and the number of Cafcass records (i.e., sets of proceedings) that women were involved in over the study period.

There are several possible legal order outcomes for children in care proceedings. Previous research provides a framework for grouping these legal orders by their likely outcomes for children.[46,153] These groupings include: remaining or returning home (case dismissed or Order of No Order), supervision at home (Family Assistance Order or Supervision Order), placed in out-of-home care (Care Order or Secure Accommodation Order), placed with extended family (Special Guardianship Orders or Child Arrangements Orders (known as Residence Order prior to April 2014)), and placed for adoption (Placement Order or Adoption Order).[20,154]

**Table 4.2: Measures used in this chapter**

| Measure | Definition | Categorisation |
|---|---|---|
| Age at birth of oldest child | Woman's age at the birth date of their oldest child recorded in the Cafcass data. | • Under 20 years<br>• 20-24 years<br>• 25-29 years<br>• 30 years and over<br>• Unknown |
| Age at index set of care proceedings | Woman's age at the start date of her index (i.e., first recorded) set of | • Under 20 years |

| | | |
|---|---|---|
| | care proceedings in the Cafcass data | • 20-24 years<br>• 25-29 years<br>• 30 years and over<br>• Unknown |
| Ethnicity | Woman's ethnicity recorded in the Cafcass data. This was provided grouped as per the NHS 16+1 ethnicity groupings. | • White or White British<br>• Black or Black British<br>• Mixed Heritage<br>• Asian or Asian British<br>• Other<br>• Missing |
| Number of children | Number of children recorded in the Cafcass data where the woman is identified as their mother. | • 1 child<br>• 2 children<br>• 3+ children |
| Father party status | Whether or not the women's child/ren's father was ever party to proceedings. | • 0 = No child's father is party in any sets of proceedings.<br>• 1 = At least one child's father is party in at least one set of proceedings. |
| Indices of Multiple Deprivation (IMD) 2010 quintiles | Indices of Multiple Deprivation (IMD) 2010 quintiles associated with a woman's recorded address during her index set of proceedings. | • 1 = most deprived<br>• 2<br>• 3<br>• 4<br>• 5 = least deprived |
| Year (April-March) of index proceedings | The year (April-March) that a woman's index set of care proceedings began. | • before 2007<br>• 2007/08-2009/10<br>• 2010/11-2012/13 |

| | | |
|---|---|---|
| | | • 2013/14-2015/16<br>• 2016/17-2018/19 |
| Final legal orders | Final legal orders made at the conclusion of any set of proceedings. Where there are multiple children involved in care proceedings, more than one type of legal order may be made. | • Any legal order<br>• Remaining or returning home<br>• Supervision at home<br>• Placed in out-of-home care<br>• Placed with extended family<br>• Placed for adoption |

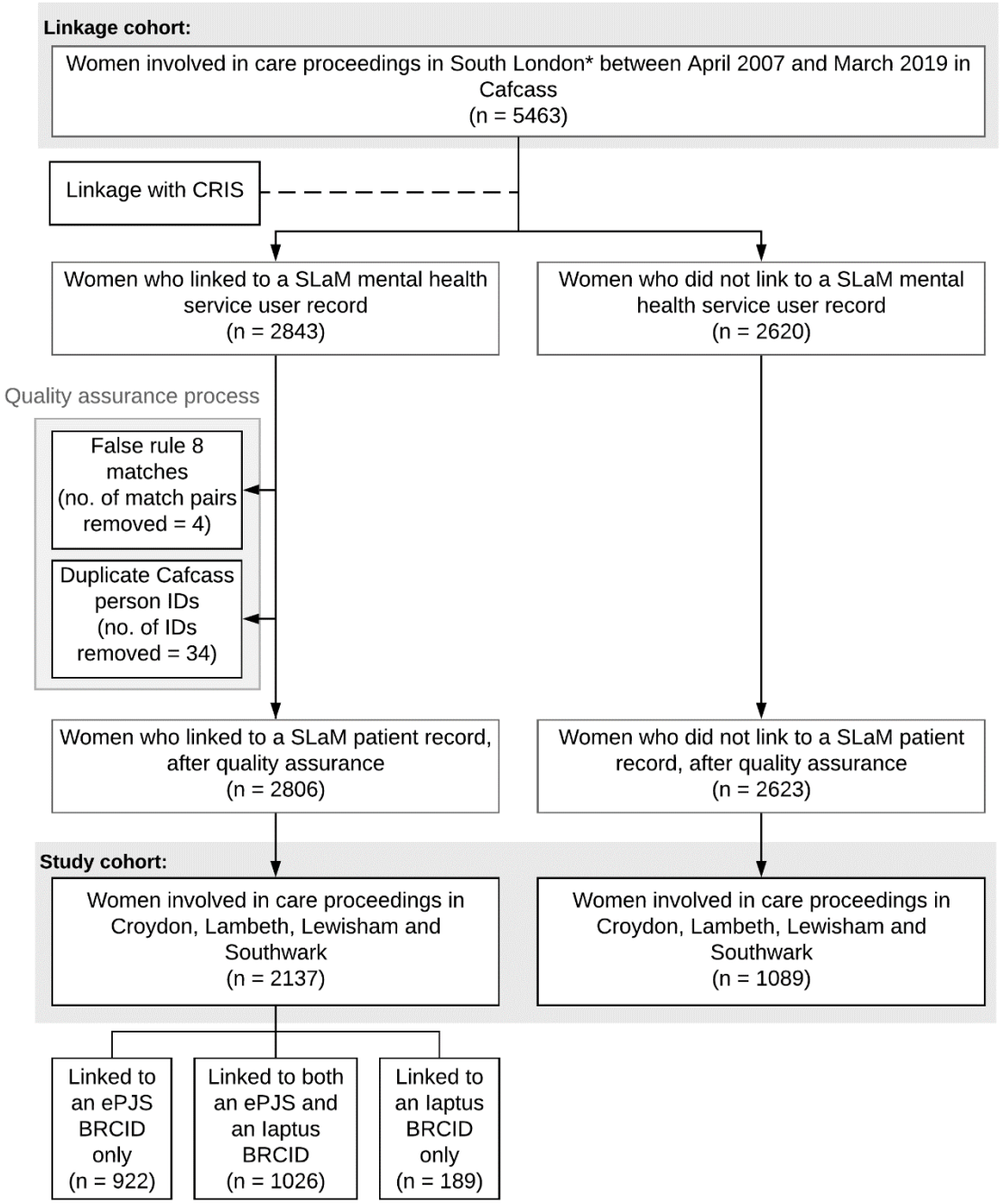
I used multivariable logistic regression to identify which sociodemographic and case characteristics were informative of linkage status, with linkage status as the outcome(1 = linked, 0 = did not link). Taking the size of the subset cohort into consideration, I decreased the number of categories among some variables to avoid small cell sizes. I also reduced the number of variables included in the analysis to avoid overfitting the model, issues with multicollinearity (i.e., where two or more explanatory variables are strongly correlated with one another), and violating the assumptions for generalised linear models.[155] For example, rather than include all final legal order types, I derived a variable to indicate whether women were ever involved in proceedings that concluded with their parental responsibility being curtailed or terminated (a binary variable where 1 = having at least one child placed into OOHC, with extended family or for adoption, 0 = having no child placed into OOHC, with extended family or for adoption. I excluded two variables, before modelling, that I did not consider to be proximally associated with linkage status - number of children in the Cafcass case management system and father party status in any set of care proceedings - to preserve model parsimony.

As I lacked complete information on care proceedings in England that occurred prior to April 2007, to reduce the likelihood of misclassifying index cases of care proceedings, I conducted a sensitivity analysis and re-ran the model for the sample whose index set of proceedings began after March 2010, building in a three-year lookback period to check for prior involvement in care proceedings.

## 4.3 Results

### 4.3.1 Linkage results

**Figure 4.6: Linkage results among the linkage cohort and the study cohort**




Note: a single cafcass person id may match to multiple BRCIDs. Therefore the removal of a match may not result in a cafcass person id no longer being linked to any SLaM mental health service user record.

* Bexley, Bromley, Croydon, Greenwich, Lambeth, Lewisham, Southwark and Wandsworth local authorities.

Over half (52%, 2843/5463) women involved in care proceedings in eight South London local authorities between April 2007 and March 2019 (i.e., the linkage cohort) linked to a SLaM patient record (Figure 4.6).

This linkage rate remained stable after accounting for 34 duplicate Cafcass person IDs and 4 false match-pairs (51.7%, 2806/5429). Two-thirds (66.2%, 2137/3226) of the study cohort linked to a SLaM patient record. De-duplication and removal of four false matches (two of which were a false pair of duplicates) resulted in three fewer links and thirty-four fewer Cafcass Person IDs in the linkage cohort. The numbers of Cafcass Person IDs that linked to a BRCID by match step are available in the appendix (Table A 4.2).

Among the study cohort, 2137 (66.2%) of women linked (Figure 4.6). Of these, 1948 (91.2%) accessed SLaM secondary or tertiary care mental health and substance misuse services (i.e., ePJS services). This would indicate a high burden of more serious mental health problems and substance misuse among women in the study cohort who linked. Only 189 (8.8%) accessed the IAPT programme alone, which is designed to provide psychological therapies to individuals experiencing common mental health disorders such as anxiety disorders and depression.

### 4.3.2 Estimating prevalence of SLaM service use among the study cohort

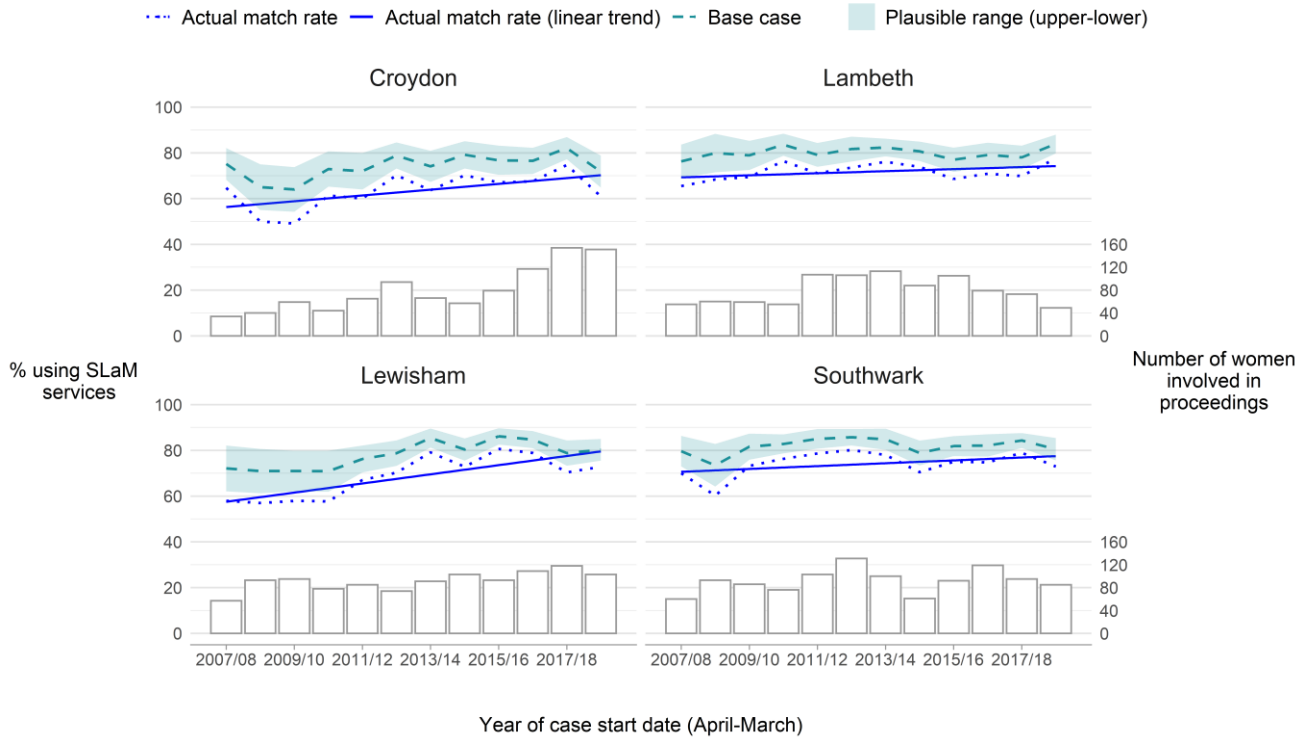
Applying the plausible value formulae described in Table 4.1 to take into account the impact of missingness among date of birth and postcode history in Cafcass on linkage, I estimated that the prevalence of SLaM service use among women in the study cohort ranged from 69.6% to 83.0%, with a base case of 76.3% (Table 4.3). The linkage rate and base case prevalence figures varied by local authority, from 71% and 80% in Southwark to 62% and 73% in Croydon. The linkage rate increased in all four local authorities over the study period (Figure 4.7), likely driven, in part, by better recording of dates of birth in Cafcass over the study period (Figure A 4.1).

**Table 4.3: Linkage rates and estimated prevalence of SLaM mental health or substance misuse service use among women in the study cohort (n = 3226)**

| | | | Estimated prevalence (plausible range) | | |
|---|---|---|---|---|---|
| Local authority of care proceedings | Number of women* | Numbers linking to a BRCID (%) | Lower limit | Base case | Upper limit |
| Croydon | 807 | 502 (62.2) | 66.0% | 73.4% | 80.7% |
| Lambeth | 773 | 529 (68.4) | 71.6% | 77.8% | 84.0% |
| Lewisham | 869 | 567 (65.2) | 68.7% | 75.7% | 82.6% |
| Southwark | 844 | 603 (71.4) | 74.3% | 80.1% | 85.8% |
| Overall | 3226 | 2137 (66.2) | 69.6% | 76.3% | 83.0% |

* Women involved in two or more sets of care proceedings in different local authorities will be double counted across the local authority -specific figures

**Figure 4.7: Trends in the estimated prevalence of SLaM mental health or substance misuse service use among women in the study cohort (n = 2137), by local authority bringing care proceedings**




Although missingness among person identifiers in CRIS was minimal (Table A 4.3), 115 Cafcass records (3.6% of the study cohort and 10.6% of the unlinked study cohort) were unlinkable due to missing both date of birth and postcode in the Cafcass data (Table A 4.4)

### 4.3.3 Characteristics of women in the study cohort, by linkage status

Table 4.4 shows the study measures stratified by linkage status. Date of birth was missing for many (13.7%), with far more women who did not link having no date of birth recorded than women who linked (32.3% vs 4.2%). Ethnicity in Cafcass was poorly recorded, with almost half of women in the study cohort missing ethnicity. Missingness varied slightly by match status (44.0% unlinked vs 50.5% linked). Across the whole study cohort, most women with non-missing ethnicity were from White (25.0%) or Black (19.7%) ethnic backgrounds.

Most women had only one child recorded in Cafcass over the study period, though women who linked tended to have more children recorded than women who did not link. This is likely linked to the fact that more women who linked had two or more sets of proceedings

in Cafcass over the study period than women who did not link (37.8% vs 23.4%). Almost half of women had an infant (<1 year old) subject to care proceedings over the study period, again this was higher among women who linked compared to women who did not link (49.7% vs 34.4%). Almost two thirds of women were party to proceedings where both parents had party status. This figure did not differ by match status. At their index proceedings, almost 40% of women had a recorded address within the 20% most deprived LSOAs in England (as per IMD 2010 measures). More women who linked lived in the most deprived areas of England compared to women who did not link (42.7% vs 33.4%). Overall, 15.4% of women had no valid English postcode and missingness among this identifier was higher among women who did not link compared to women who did (23.6 vs 11.3%). Slightly more women who linked had their index set of proceedings on or after April 2010 compared to women who did not link.

Most women (89.0%) in the study cohort had at least one child with a recorded final legal order in Cafcass. This varied little by linkage status. There was also little difference between women who did and did not link in the proportions of women with a child subject to either a case dismissal or Order of No Order (12.5% vs 15.6%), supervision at home (22.7% vs 16.9%) , placed into out-of-home care (30.8% vs 31.8%), and placed for adoption (24.2% vs 20.5%). More women who linked had children placed with extended family (34.6% vs 19.6%) than women who did not link.

**Table 4.4: Sociodemographic and case characteristics among women in the study cohort, by linkage status (n = 3226).**

| Characteristics recorded in Cafcass' case management system | | Unlinked (n = 1089, 33.8%) | Linked (n = 2137, 66.2%) | Overall (n = 3226) |
|---|---|---|---|---|
| Age at birth of oldest child recorded in Cafcass' case management system | Under 20 years | 188 (17.3) | 616 (28.8) | 804 (24.9) |
| | 20-24 years | 193 (17.7) | 506 (23.7) | 699 (21.7) |
| | 25-29 years | 168 (15.4) | 368 (17.2) | 536 (16.6) |
| | 30 years and over | 188 (17.3) | 558 (26.1) | 746 (23.1) |
| | Unknown | 352 (32.3) | 89 ( 4.2) | 441 (13.7) |
| Age at index set of proceedings | Under 20 years | 64 ( 5.9) | 249 (11.7) | 313 ( 9.7) |
| | 20-24 years | 96 ( 8.8) | 361 (16.9) | 457 (14.2) |
| | 25-29 years | 119 (10.9) | 371 (17.4) | 490 (15.2) |
| | 30 years and over | 458 (42.1) | 1067 (49.9) | 1525 (47.3) |
| | Unknown | 352 (32.3) | 89 ( 4.2) | 441 (13.7) |
| Ethnicity | White or White British | 206 (18.9) | 599 (28.0) | 805 (25.0) |
| | Black or Black British | 226 (20.8) | 411 (19.2) | 637 (19.7) |
| | Mixed Heritage | 42 ( 3.9) | 125 ( 5.8) | 167 ( 5.2) |
| | Asian or Asian British | 31 ( 2.8) | 30 ( 1.4) | 61 ( 1.9) |
| | Other* | 34 ( 3.1) | 32 ( 1.5) | 66 ( 2.0) |
| | Missing | 550 (50.5) | 940 (44.0) | 1490 (46.2) |
| Number of children recorded in Cafcass' case management system | 1 | 646 (59.3) | 1054 (49.3) | 1700 (52.7) |
| | 2-3 | 344 (31.6) | 834 (39.0) | 1178 (36.5) |
| | 4+ | 99 ( 9.1) | 249 (11.7) | 348 (10.8) |
| Youngest child involved in proceedings | <3 weeks old** | 150 (13.8) | 601 (28.1) | 751 (23.3) |
| | 4weeks - 1 year old | 224 (20.6) | 461 (21.6) | 685 (21.2) |
| | 1-4 years old | 220 (20.2) | 430 (20.1) | 650 (20.1) |
| | 5-9 years old | 210 (19.3) | 359 (16.8) | 569 (17.6) |
| | 10-14 years old | 216 (19.8) | 240 (11.2) | 456 (14.1) |
| | 15 years and older | 69 ( 6.3) | 46 ( 2.2) | 115 ( 3.6) |
| Father is party in at least one set of proceedings? | | 695 (63.8) | 1373 (64.2) | 2068 (64.1) |
| IMD 2010 quintile associated with | 1 – most deprived | 364 (33.4) | 912 (42.7) | 1276 (39.6) |
| | 2 | 297 (27.3) | 686 (32.1) | 983 (30.5) |

| | | | | |
|---|---|---|---|---|
| their recorded address during index set of proceedings | 3 | 117 (10.7) | 230 (10.8) | 347 (10.8) |
| | 4 | 42 ( 3.9) | 57 ( 2.7) | 99 ( 3.1) |
| | 5 – least deprived | 12 ( 1.1) | 11 ( 0.5) | 23 ( 0.7) |
| | missing | 257 (23.6) | 241 (11.3) | 498 (15.4) |
| Year (April-March) that index set of proceedings began | before 2007 | 44 ( 4.0) | 74 ( 3.5) | 118 ( 3.7) |
| | 2007/08-2009/10 | 284 (26.1) | 444 (20.8) | 728 (22.6) |
| | 2010/11-2012/13 | 254 (23.3) | 571 (26.7) | 825 (25.6) |
| | 2013/14-2015/16 | 231 (21.2) | 505 (23.6) | 736 (22.8) |
| | 2016/17-2018/19 | 276 (25.3) | 543 (25.4) | 819 (25.4) |
| Final legal orders made in any set of proceedings for at least one child† | Any legal order made | 936 (86.0) | 1935 (90.5) | 2871 (89.0) |
| | Returned or remained home | 170 (15.6) | 267 (12.5) | 437 (13.5) |
| | Supervision at home | 184 (16.9) | 486 (22.7) | 670 (20.8) |
| | Placed into OOHC | 346 (31.8) | 658 (30.8) | 1004 (31.1) |
| | Placed with extended family | 213 (19.6) | 739 (34.6) | 952 (29.5) |
| | Placed for adoption | 223 (20.5) | 517 (24.2) | 740 (22.9) |
| Two or more sets of care proceedings recorded | | 255 (23.4) | 807 (37.8) | 1062 (32.9) |

*Other includes the Chinese and 'other' categories which captures all other ethnicities.

** Includes unborn children who become subject to an existing set of care proceedings after birth (e.g., the mother was pregnant during proceedings)

IMD = Indices of Multiple Deprivation; OOHC = out-of-home care.

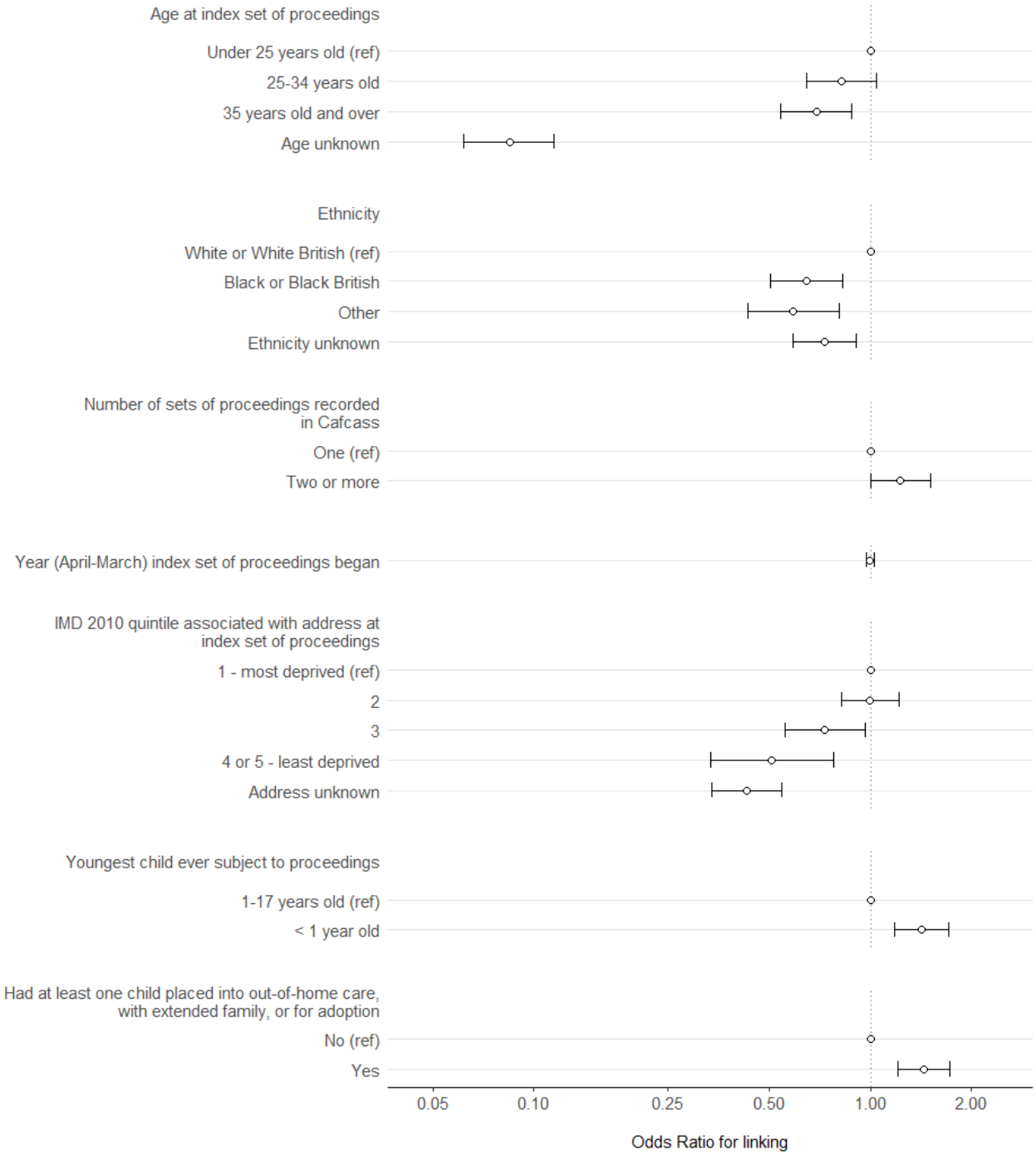
† Non-mutually exclusive categories

### 4.3.4 Identifying sociodemographic and case characteristics that are associated with linkage status

Compared to women in the study cohort who were under 25 years old when their index proceedings began, there was evidence that women who were at least 35 years old (OR: 0.69, 95% CI: 0.54 to 0.88) or whose date of birth was missing in Cafcass (0.08, 0.06 to 0.11) had lower odds of linking to a SLaM service user record (Figure 4.8). The odds of linking also differed by ethnicity; compared to women recorded as having White ethnicity, there was

evidence that women recorded as having Black ethnicity (0.65, 0.50 to 0.83), all other ethnic groups (0.59, 0.43 to 0.81), or with no recorded ethnicity (0.73, 0.59 to 0.91) had lower odds of linking. There was no evidence of an association between the year that index proceedings began and linking (1.00, 0.97 to 1.02). There was weak evidence that having two or more case records in Cafcass compared to only one (1.23, 1.00 to 1.51) were associated with higher odds of linking. Women who lived in the least deprived areas of England at their index proceedings were less likely to link compared to women in the most deprived areas (0.51, 0.34 to 0.78). There was evidence that having an infant subject to proceedings (1.42, 1.18 to 1.71) or a child placed into out-of-home care, placed with extended family, or placed for adoption were associated with higher odds of linkage (1.44, 1.20 to 1.73). These results were consistent with those from the sensitivity analysis (n = 2380). The full model results from both the main and sensitivity analyses are available the chapter appendix (Table A 4.5 and Table A 4.6).

**Figure 4.8: Odds ratios and 95% confidence intervals from logistic regression modelling of linkage status among women in the study cohort (n = 3226)**



## 4.4 Discussion

### 4.4.1 Key findings

Two-thirds of women involved in care proceedings within local authorities served by SLaM (Croydon, Lambeth, Lewisham, and Southwark) linked to a SLaM patient record at some point: 91% of women who linked had contact with secondary or tertiary mental health services indicating high incidence of severe or complex mental health problems or substance misuse among this population. Accuracy of linkage was high – fewer than 1% of linked records were false matches and fewer than 3% had a duplicate Cafcass Person ID. I also identified several sociodemographic and case characteristics that were associated with linkage status, including ethnicity, maternal age, deprivation, number of sets of care proceedings, having parental responsibility curtailed or terminated, and having an infant involved in care proceedings.

### 4.4.2 Findings in context

The prevalence of two-thirds of women in contact with mental health care at some point before November 2019, when linkage was completed, is more than double the previously reported prevalence of one in three women aged 16-54 years old (32.3%) reporting ever being diagnosed with a mental health problem in England in 2014.[156] It is also higher than the previously reported prevalence of mental illness among women whose children entered care or were involved in care proceedings found in studies identified in my systematic literature review (Chapter 3: Literature review of data linkages).

Most women entered motherhood at a younger age compared to the general population of women giving birth in England.[157] After adjusting for other sociodemographic and case characteristics, women who were younger at their index set of proceedings were more likely to link to a SLaM service user record than women who were at least 35 years old, consistent with previous research highlighting higher prevalence of mental health problems among young mothers in the UK.[18]

Black women, women from other ethnic groups and women with unknown ethnicity in Cafcass had lower odds of linking to a SLaM service user record than White women. This is likely partly due to systemic barriers to mental health service use that adversely affect Black

and minority ethnic communities in South London.[158] There is also evidence that erroneous recording of person identifiers in administrative datasets is more common among Black, Asian and Mixed Heritage ethnic groups compared to White ethnic groups.[159,160]

Many women who linked had an infant subject to proceedings and this was associated with higher odds of linking. It is possible that this association could be partly driven by strong referral pathways between children's social services and SLaM perinatal services, which include a mother-baby unit, for pregnant women experiencing mental health problems and substance misuse. There is also a growing body of research demonstrating the enduring impact of having children placed into care on women's mental health, which is likely to be particularly severe where the child is placed at a very young age.[61,62,161,162]

Finally, women whose parental responsibility was curtailed or terminated at the conclusion of a set of proceedings were more likely to link and, therefore, may be at greater risk of serious mental illness. Further analyses of the linked data are needed to understand whether the risk of children being subject to these legal orders varies by mental health diagnosis and to characterise women's SLaM service use before, during and after care proceedings.

### 4.4.3 Strengths and limitations

This is the first linked data resource of its kind in England, yielding a high number of matches, of which very few were found to be false. However, there are a number of limitations to consider.

First, it is likely that some women in the study cohort should have linked to a SLaM patient record but did not due to poor recording of person identifiers in the Cafcass data. For example, about 4% of women in the study cohort were unlinkable due to missing both date of birth and postcode history in the Cafcass data. Missed links would underestimate the number of women with a SLaM patient record among the study cohort, which could lead to underestimation of CRIS measures, such as mental health diagnoses, among the study cohort.[135] It is also possible that, if there were systematic differences between those with a missed link (which is unknowable is these data) and those who successfully linked, this could introduce selection bias into the subset of women in the study cohort who linked.(i.e., they would not representative of the group of women in the study cohort who accessed

SLaM services before linkage occurred). Therefore, any findings from these data must be interpreted in light of these potential biases.

Second, data on ethnicity is also poorly recorded in Cafcass, though data quality has improved in recent years, and only broad groupings of ethnicity were available.[75]

Third, I did not estimate mental health and substance misuse service use for the four non-constituent local authorities (Bexley, Bromley, Greenwich, and Wandsworth) where mental health services are chiefly delivered by other NHS mental health trusts. Nevertheless, the inclusion of Cafcass data for women involved in care proceedings in these neighbouring local authorities where SLaM delivered only some services, such as substance misuse services, may afford researchers who are interested in the use of a particular service among this population group a larger sample size.

Fourth, I identified a small number (2.4%) of duplicated Cafcass person IDs among women who linked but was unable to identify duplicates among unlinked Cafcass person IDs; therefore, the number of women returning to court among the unlinked may be underestimated in these data. However, I expect this to be minimal as Cafcass de-duplicate people upon discovery within their administrative system and the Cafcass person identifiers extract in this study was subject to additional pre-processing, including de-duplication of individuals, prior to linkage (further details on Cafcass data processing can be found in the chapter appendix, page 253).

Finally, mental health and substance misuse need among women in the four local authorities served wholly by SLaM may be underestimated as not all women with these conditions may not be known to SLaM services. For example, many people with mental health problems are adequately treated via GPs and prior research has shown that some people with anxiety or depression are not diagnosed and are therefore untreated.[15,163] In addition, some women may avoid seeking help for mental health problems or substance misuse due to fears that their children may be removed from their care.[164] SLaM also ceased providing substance misuse services to Lewisham in 2010, Croydon in 2014, and Southwark in 2015. Therefore, service use records for women in the study cohort accessing substance misuse services in these areas after these dates will not be captured in these linked data. It is also possible that some comorbid mental health conditions were not recorded if symptoms

between the conditions overlap making diagnosis difficult (e.g., schizophrenia and depression)[165]

# Chapter 5: Characterising mental health and substance misuse among women with children in care proceedings

**Chapter overview**

In this chapter, I described my first study using the CRIS-Cafcass data linkage. This study addressed objective 4a of this thesis:

*to characterise the type, intensity and severity of mental health and substance misuse among women with children involved in care proceedings. I used a retrospective, matched cohort study design with linked Cafcass and CRIS data.*

My study cohort comprised the 2137 women with a child subject to care proceedings in the South London and Maudsley NHS Foundation Trust (SLaM) catchment area between April 2007 and March 2019 who linked to a SLaM patient record. The matched control group comprised 17,096 women of reproductive age (16-55yrs) with a SLaM patient record, who were not involved in care proceedings. I found that women involved in care proceedings who had a SLaM patient record (the 'study cohort') had higher rates of schizophrenia spectrum disorders, personality disorders and substance misuse, compared to the matched controls. Women in the study cohort were also more likely to be admitted to a SLaM inpatient unit or to be sectioned under the Mental Health Act. Finally, women in the study cohort had higher age-adjusted mortality rates, compared to the matched controls, with age defined as age at women's first SLaM contact. These findings support other research in the UK in highlighting the need for closer working between children's social care, family court and adult mental health and substance misuse services to respond to the considerable health needs of this population.

A preprint manuscript based on this chapter was deposited to the OSF preprints repository in March 2021.

Pearson RJ, Grant C, Wijlaars L, Finch E, Bedston S, Broadhurst K, et al. Mental health service use among mothers involved in public family law proceedings: linked data cohort study in South London 2007-2019 2021. doi:10.31219/osf.io/htcdy.

## 5.1 Background

There are high rates of mental health problems and substance misuse among mothers whose children are subject to public family law proceedings ('care proceedings') in England, prompting calls to strengthen interagency working between family courts, children's social care and health services [46,47,166–168]. Earlier health support for birth parents may mitigate some of the child health risks associated with parental mental illness [24,169–172], including rare outcomes such as serious or fatal maltreatment [173]. It could also lead to fewer children requiring care proceedings, which are costly to the taxpayer and one of the most intrusive forms of child protection. However, there is currently limited evidence characterising parental mental health problems and mental health service use in relation to care proceedings [21,58,174]. Population-based characterisation of maternal mental health need and service use among birth mothers is needed, yet suitable data are lacking [78]. In several settings, researchers have overcome this barrier by linking administrative child protection and health datasets [64,82,88,129,131]. Within the SAIL Databank,[82] Griffiths et al used new linkages between Welsh family court data and health data on antenatal care, hospitalisations and general practitioner (GP) contacts, and found that over half of women with infants in proceedings in Wales had a mental health diagnosis in the two years prior to childbirth [84]. The most common diagnoses were depression and anxiety [175]. In England, a dearth of similarly linked data is limiting the development of evidence-based policy for parental mental health and substance misuse in the context of child protection [3,78].

In this descriptive study, I used a cohort of women involved in care proceedings who linked to de-identified patient records from the South London and Maudsley NHS Foundation Trust (SLaM) (serving ~1.4 million residents) [97,168]. In collaboration with the National Institute of Health Research (NIHR) Maudsley Biomedical Research Centre (BRC), permissions were sought to use the CRIS-Cafcass linked data in conjunction with data on the broader population of approximately 150,000 women aged 16 to 55 years old who had ever accessed SLaM services. This enabled me to characterise mental health service use between women in care proceedings who accessed SLaM services and a matched control group comprising women of a similar age accessing SLaM services. The findings should inform policy and service development across family justice, children's social care, and health. The aim of this study was to describe the type, severity, and timing of mental health problems

and substance misuse among women in care proceedings who linked to the mental health records, and a matched control group of female mental health service users with no care proceedings. To investigate long-term health outcomes, I looked at women's risk of dying following care proceedings.

## 5.2 Methods and materials

### 5.2.1 Study design

This descriptive study has a retrospective, matched cohort design to enable comparison between the study cohort and a control population. The matching process is described in section 5.2.3.

### 5.2.2 Data

The CRIS and Cafcass databases and the linked CRIS-Cafcass data have previously been described in Chapter 4. There were 3226 women with a child subject to care proceedings in the SLaM catchment area between 1 April 2007 and 31 March 2019 and 2137 (66.2%) linked to a SLaM patient record in November 2019 (when linkage occurred).[2] Because the CRIS database has captured data from all SLaM services since January 2007 but only from some services pre-2007, I reviewed the quality of dates for referrals, inpatient admissions, and outpatient attendances prior to 2007. Based upon these checks, I used an observation window of 1 January 2005 and 31 March 2020 for the CRIS data. I defined follow-up as the time (in years) between a woman's first contact with SLaM (referral, inpatient admission, or outpatient attendance) in the observation window and 31 March 2020, or death, whichever was earliest. Coverage of data used in this study are further described in Figure 5.1.

### 5.2.3 Study cohort

My study cohort comprised all women with a child subject to care proceedings in Croydon, Lambeth, Lewisham, and Southwark local authorities ('the SLaM catchment area') between 1st April 2007 and 31st March 2019, who linked to a SLaM patient record (n = 2137). Women who had multiple sets of care proceedings between April 2007 and March 2019 were

included in the cohort only once. In chapter 3, I showed that women in this cohort generally became mothers at a younger age, compared to the general population of mothers in England. Most had only one child recorded in Cafcass and half had an infant (<12 months old) subject to care proceedings, consistent with prior research [32,33]. A third of women in this cohort had at least two sets of proceedings recorded in Cafcass between 2007-2019.

### *Constructing a matched control group*

Using the CRIS data, I created a comparator group (n = 153,486) of 'unexposed' women from all women living in the SLaM catchment area who accessed SLaM services between 1 April 2007 and 31 March 2019, aged 16-55 years (i.e., reproductive age), who did not link to Cafcass (Figure 4.2). I excluded women who linked to Cafcass, indicating that they had been involved in care proceedings between 2007-2019, either in the SLaM catchment area or in four neighbouring local authorities which SLaM provides some services to (Bexley, Bromley, Greenwich, Wandsworth). I exactly matched women in the comparator group to women in the study cohort based on the following strata: 1) having a record from a SLaM secondary and tertiary service, IAPT or both and 2) the calendar year of women's first SLaM contact within the observation window. This ensured that both groups had similar distributions of follow-up times and of women accessing IAPT and non-IAPT services, recognising that IAPT caters to very different mental health needs than most secondary and tertiary mental health services. I grouped women in the comparator group by the matching strata and randomly selected women without replacement at a ratio of 8:1, yielding 17,096 matched controls. The ratio was determined by the smallest matching strata. I was unable to match on parenthood status as this information is not routinely captured across all SLaM services and collection of this information is likely to be biased towards instances where there are child welfare concerns.

**Figure 5.1: Data coverage**

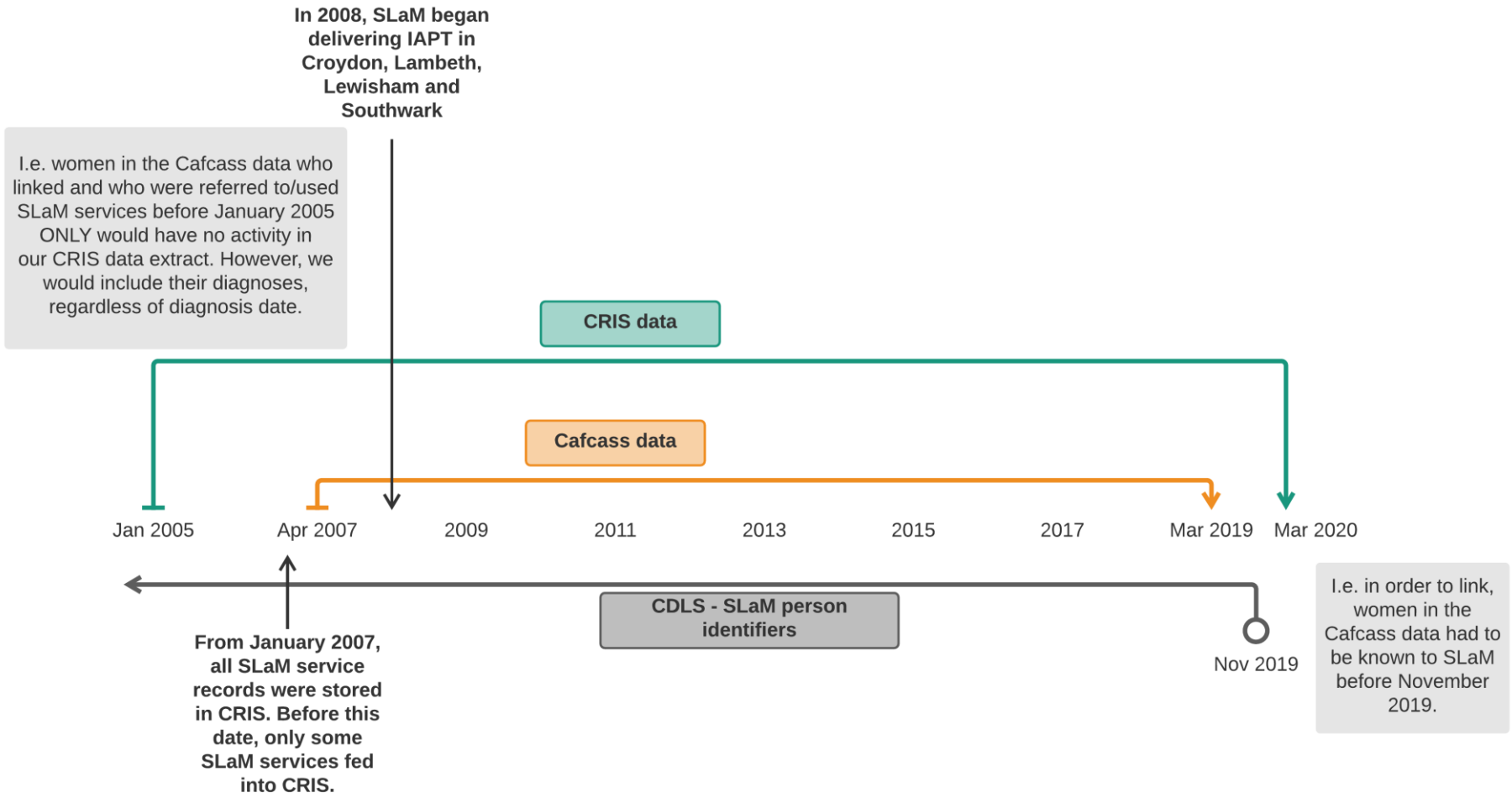
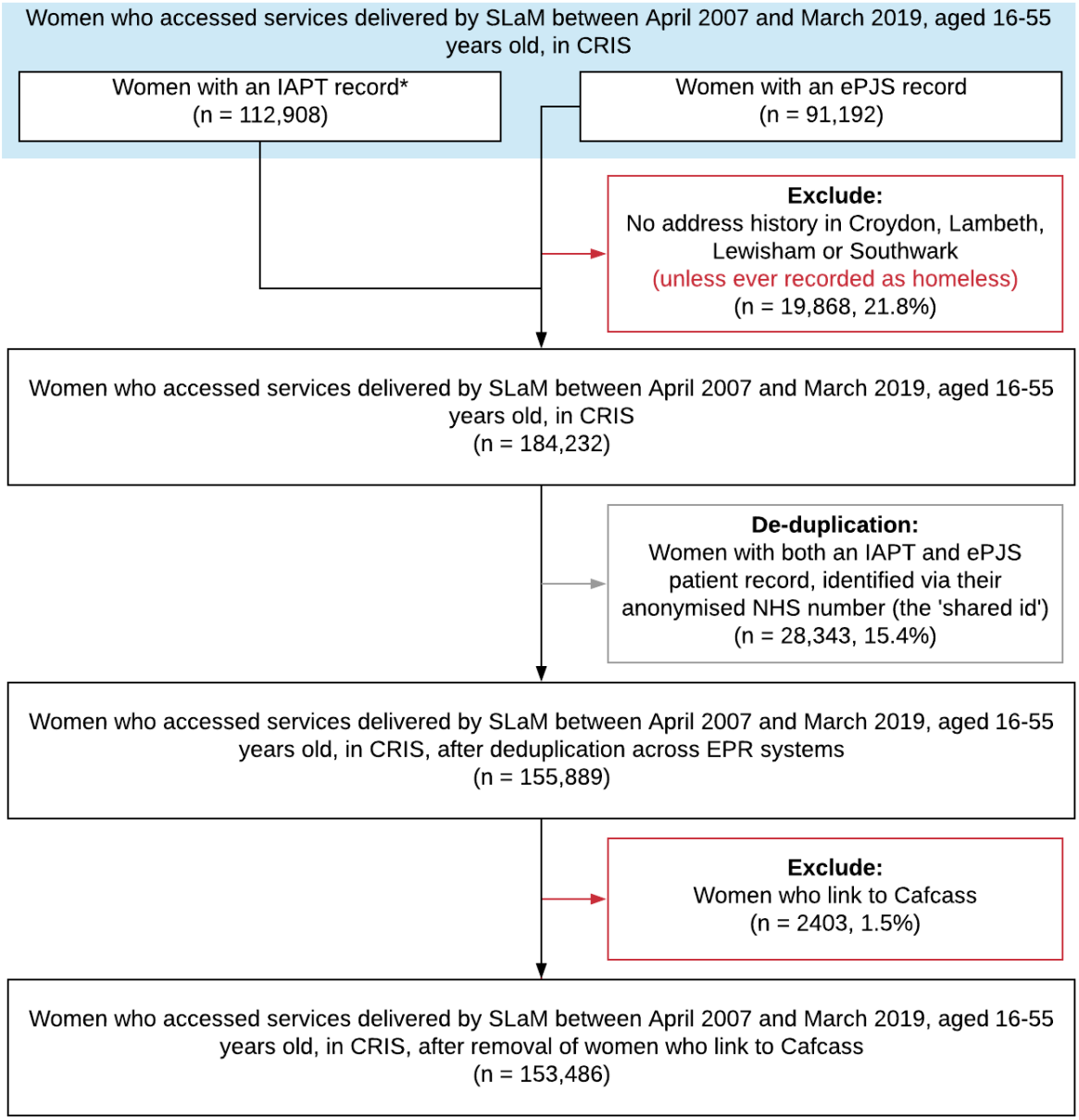


**Figure 5.2: Building a comparator cohort: Women aged 16-55 years old, accessing SLaM secondary and tertiary services or IAPT between April 2007 and March 2019, with an address history in the SLaM constituency (Croydon, Lambeth, Lewisham, and Southwark).**




* SLaM provides the Improving the Access to Psychological Therapies (IAPT) programmes in Croydon, Lambeth, Lewisham and Southwark, which uses its own electronic patient system called Iaptus. Only patients registered to a GP within the local authority in which the IAPT programme is delivered are eligible for referral. All other SLaM services use the electronic patient journey system (ePJS) to record patient information.

CRIS = Clinical Research Interactive Search database; EPR = electronic patient record; SLaM = South London and Maudsley NHS Mental Health Foundation Trust.

### 5.2.4 Measures

#### *Sociodemographic characteristics*

Due to the poorer data availability in Cafcass for date of birth (4.2% missing) and ethnicity (44.0%) among the study cohort (Table 4.4), I used these fields in CRIS where non-missing, and from Cafcass otherwise.[168] I used date of birth to derive women's age at their first SLaM contact. I grouped ethnicity into the following five categories based on the NHS 16+1 ethnic data categories: Asian or Asian British, Black or Black British, Mixed heritage, White, Other ethnic background.[176]

#### *Severity and intensity of mental health service use*

I categorised SLaM service use within the observation window into four types of activity: 1) referrals (accepted and rejected), 2) outpatient appointments (planned and attended), 3) inpatient admissions and 4) being sectioned under the mental health act. I further categorised referrals and outpatient appointments by whether the SLaM service was IAPT. I also derived measures indicative of women's engagement with services. This included discharged referrals due to 'failure to engage' (i.e., persistent non-attendance or poor engagement with the service) and the proportion of outpatient appointments over the observation window that were missed due to non-attendance, attending too late to be seen, or patient cancellation. For women in the study cohort, I calculated the time between their first SLaM contact over the observation window and their first recorded ('index') set of care proceedings in Cafcass.

#### *Mental health and behavioural diagnoses*

Psychiatric diagnoses were captured in structured fields recorded in CRIS using ICD-10 codes.[99] Diagnoses were also extracted from free-text fields using natural language processing applications developed by the NIHR Maudsley BRC CRIS team.[142] As I was interested in diagnoses ever made, I did not need exact dates for diagnoses and therefore included diagnoses recorded at any time up to 31 March 2020 (Figure 5.1). I grouped mental and behavioural disorder diagnoses (ICD-10 Chapter V) into seven categories and defined serious mental illness as schizophrenia, schizotypal, delusional, or bipolar disorder (

Table 5.1).

### *Substance misuse and learning disability*

Women were coded as having a record of substance misuse if they had a substance misuse -related diagnosis [177], or accessed any SLaM substance misuse services (excluding services for smoking). To investigate dual-diagnosis (both psychiatric and substance misuse diagnoses), we identified women with both a record of substance misuse and a psychiatric diagnosis (Table 1), excluding drug and alcohol -related psychiatric disorders. To understand the types of substances women in the study cohort were using, I used National Drug Treatment Monitoring System (NDTMS) records held in CRIS about patients accessing SLaM substance misuse services.[178] NDTMS is a national data collection, operated by Public Health England (PHE), which captures information about patients accessing substance misuse services. Only patients who provide informed consent for their data to be collected by PHE are included in NDTMS.

Women were coded as having a learning disability if they had a related ICD-10 diagnosis [179], or accessed any SLaM services for people with learning disabilities.

**Table 5.1: ICD-10 codes used to identify mental health and behavioural disorder diagnoses in CRIS records up to 31 March 2020.**

| Diagnosis categories | ICD-10 codes |
|---|---|
| Schizophrenia, schizotypal and delusional disorders | F20-29 |
| Severe mood disorders (i.e., bipolar affective disorder, severe or moderate depressive disorders, puerperal psychosis, and postnatal depression) | F30-31, F32.1-32.3, F33.1-33.3, F34.0-34.1, F53.0-53.1 |
| Anxiety, somatoform, and stress-related disorders | F40-48 |
| Other depressive disorders | F32.0, F32.8-32.9, F33.0, F33.4-33.9, F34.8-34.9, F38-39 |
| Drug and alcohol -related disorders | F10-19 (excluding F17) |
| Personality disorders | F60-63 |
| Other psychiatric disorders (including eating disorders, other perinatal psychiatric disorders and 'Unspecified mental illness') | F50-3, F53.8-53.9, F99 |
| Disorders of psychological development and behavioural and emotional disorders with onset usually occurring in childhood or adolescence | F80-F89, F90-F98 |

Note**:** I defined serious mental illness as severe mood disorders or schizophrenia, schizotypal and delusional disorders.

### *Specialist mental health service use*

I explored use of several specialist mental health services including: perinatal (including a mother-baby unit); psychosis; acute (e.g., places of safety, home treatment teams, and short and

long-term inpatient care); forensic, criminal justice -related (e.g., non-forensic services providing psychiatric care to individuals involved in criminal justice system or as part of a criminal sentence); substance misuse; child and adolescent mental health services (CAMHS); and parent or whole-family (e.g., CAMHS family services, parenting assessment or support, and parent-child interaction services). Service groups were not mutually exclusive as some services fit into two or more groups. Service types were identified by comparing service location, and service name fields in CRIS to the CRIS service directory.

#### *Date of death*

I used the 'date of death' field in CRIS to identify deaths within the observation window and to derive age at death.[142] This includes around 80% of registered deaths.[180]

### 5.2.5 Statistical analysis

#### *Descriptive statistics*

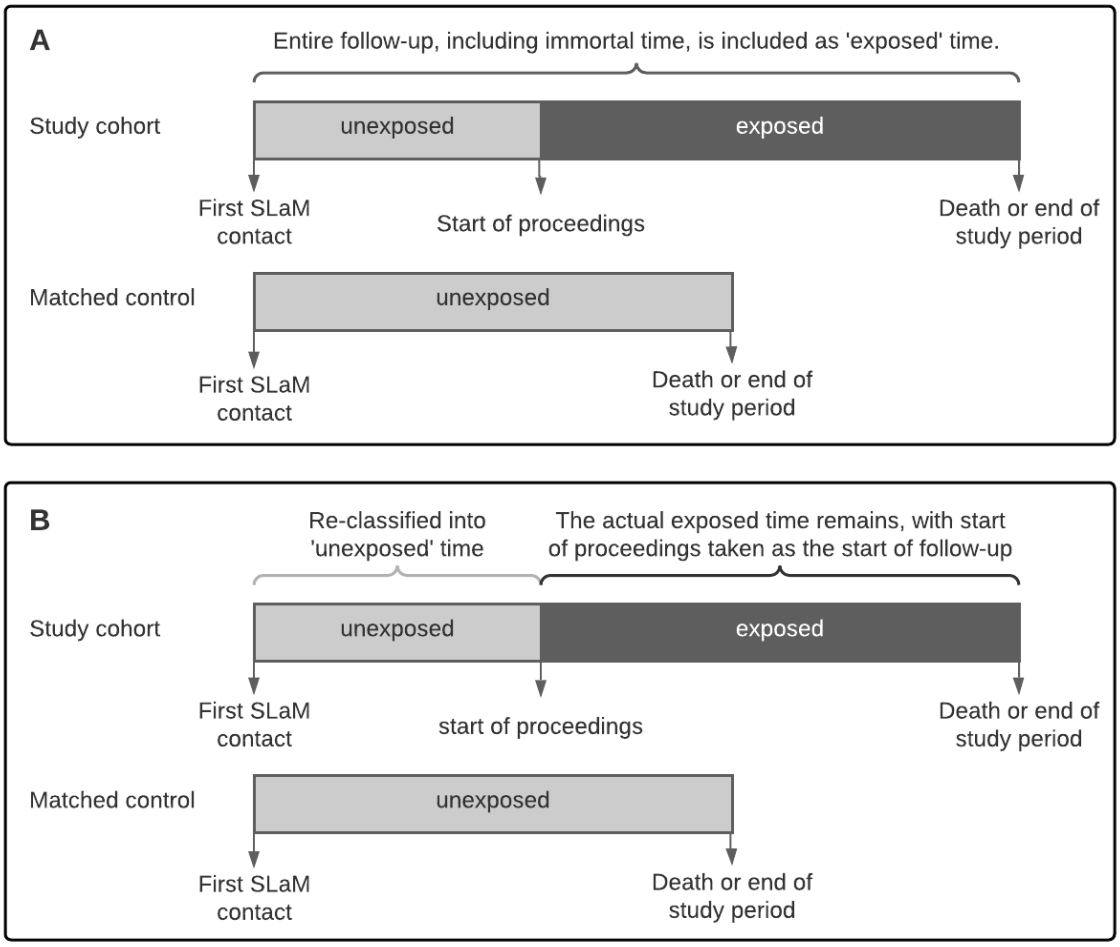
I described the study measures by group (study cohort or matched controls) using frequencies and percentages for discrete measures and medians with 25$^{th}$ and 75$^{th}$ percentiles for continuous measures. Anticipating differences in the distribution of age at first SLaM contact between the two study groups, I produced age-standardised percentages for the matched controls, using the study cohort as the reference population (age categories: 0-17 years old, 18-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50+).

#### *Mortality and immortal time bias*

To compare mortality between the two groups, I first needed to account for immortal time bias among women involved in care proceedings. Women in the care proceedings cohort whose index care proceedings began after their first SLaM contact had to be alive at least until their index proceedings began, whereas there was no such restriction among the matched controls. If I had not accounted for this bias, the difference in mortality over follow-up between study cohort and the matched controls may have been underestimated. To correct for this bias, I used Cox proportional hazards models with time to death over follow-up as the outcome, censored at 31 March 2020. I included 'involvement in care proceedings' (yes = 1, no = 0) and 'age at first SLaM contact' (years, i.e., continuous) as model covariates, with 'involvement in care

proceedings' modelled as a time-dependent covariate. This meant that, for women whose index proceedings began after their first SLaM contact, I split their follow-up time into two rows at the start date of index proceedings (Figure 5.3). The time before they entered care proceedings was coded as 0 to reflect that they were unexposed during this period (i.e., immortal time) and the time from the start of their index proceedings to the end of follow-up was coded as 1 (reflecting the period after onset of care proceedings). Three of the matched controls (0.5% of matched controls who died and 0.02% of all matched controls) were excluded from modelling as their date of death occurred before their first SLaM contact, assumed to be erroneous recording.

**Figure 5.3: Handling immortal time between start of follow-up (first SLaM contact) and start of care proceedings**



I visually assessed the proportional hazards assumption using Schoenfeld residual plots and also tested the correlation between the Schoenfeld residuals and survival time using the cox.zph function in the R survival package.[181] I fitted alternative models allowing the independent association between age at first SLaM contact and death to be non-linear using quadratic and, later, natural spline functions. I checked for influential observations using dfbeta value plots and found no evidence of outliers. As a sensitivity analysis, I also fit the Cox proportional hazards model with 'involvement in care proceedings' as a time-invariant covariate to better understand the impact of not accounting for the immortal time between first SLaM contact and start of care proceedings.

I used my Cox proportional hazards model to calculate the expected 5 and 10 year mortality rates (from first SLaM contract) for the study cohort and the matched controls, using the Aalen-Johansen method.[182] For these predictions, I held age constant at the 25%, 50% and 75% quantiles of age at first SLaM contact among the study cohort. I derived asymptotic 95% confidence intervals for these rates using the log-log transformation. These analyses were performed in R v3.6, using functions in Therneau et al's survival package.[181]

## 5.3 Results

Most women in the study cohort (n = 1686, 78.9%) were known to SLaM before their index set of care proceedings began (median time from first SLaM contact to index proceedings: 2.3 years; 25% quantile: 5.5 years, 75% quantile: 53 days).

### 5.3.1 Matching variables

By design of the matching procedure, there was exact balance among the matching variables (Table A 5.3). Most women in the study cohort (n = 1948, 91.2%) were referred to, or accessed, SLaM secondary or tertiary mental health services within the observation window (January 2005 to March 2020) and almost half accessed specialist mental health services and IAPT services (n = 922, 43.1%), with very few having accessed only IAPT services (n = 189, 8.8%). The median length of follow-up (from first SLaM contact to March 2020 or death) was 10.6 years (Table 5.2).

### 5.3.2 Age and ethnicity

All women had date of birth recorded in CRIS. Figure 5.4 shows that women in the study cohort were typically younger at their first SLaM contact (median age: 28.2 years), compared to matched controls (30.7 years). Figure 5.5 shows that half of women in either group were from a White ethnic background (study cohort: 48.9%; matched controls: 52.7%). A higher proportion of women in the study cohort were from Black or mixed ethnic backgrounds. A small number of women in either group were from Asian ethnic backgrounds. Fewer women in the study cohort had unknown ethnicity (2.6% vs 7.2%) or were from other ethnic backgrounds (6.7% vs 10.6%), compared to matched controls. Counts for Figure 5.4 and Figure 5.5 are available from Table A 5.4.

**Figure 5.4: Age distribution of women at their first contact with SLaM (inpatient, outpatient, or referral) among the study cohort (n = 2,137) and the matched controls (n = 17,096)**

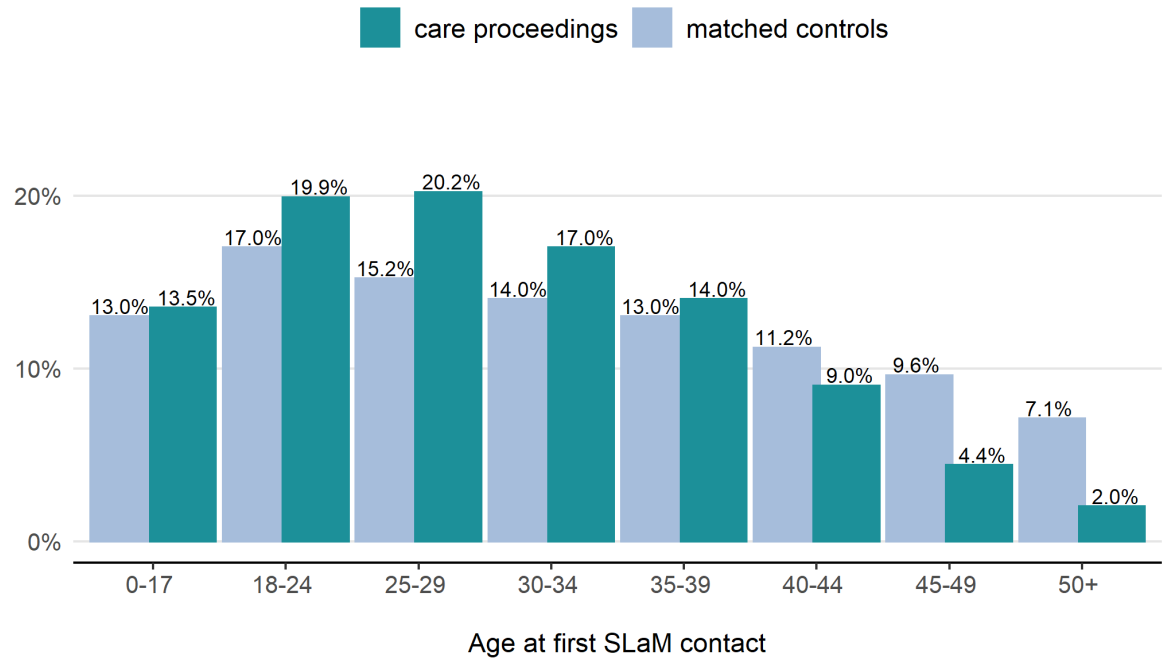
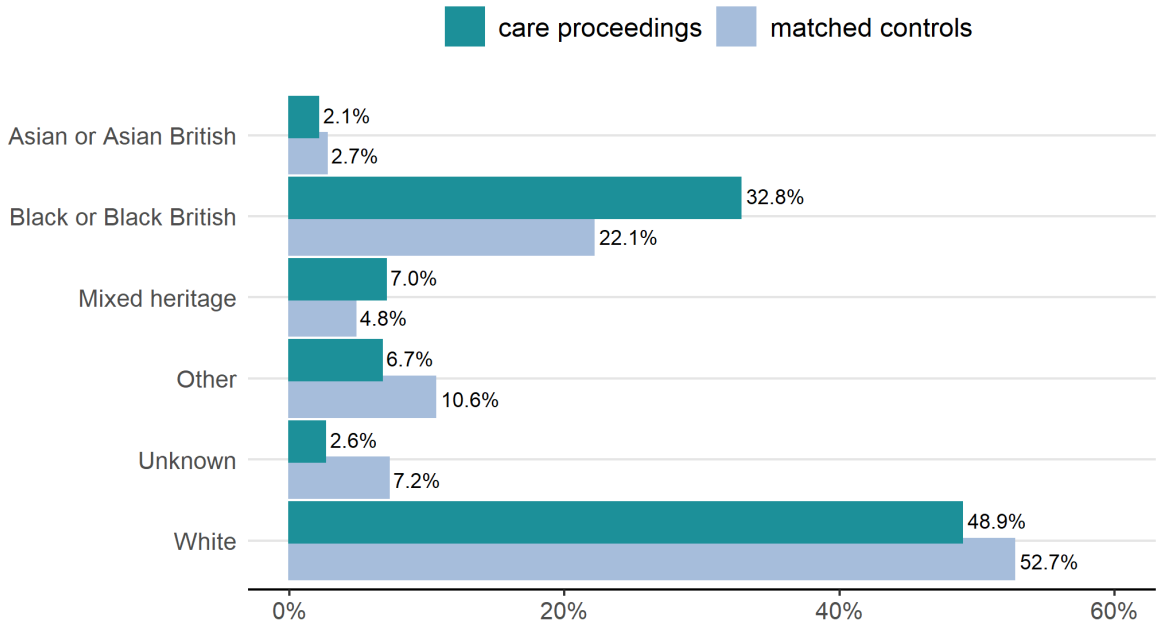



**Figure 5.5: Ethnicity among the study cohort (n = 2137) and matched controls (n = 17,096)**



### 5.3.3 Severity and intensity of mental health service use

Half of women had an accepted IAPT referral, though more women in the study cohort had a rejected IAPT referral (Table 5.2). Compared to matched controls, fewer women in the women in the study cohort had an IAPT attendance. Among women with a planned IAPT attendance, women in the study cohort typically missed a greater proportion of planned attendances, compared to the matched controls. Most women with an accepted IAPT referral were discharged due to failure to engage, though this was more prevalent among women in the study cohort.

Over 80% of women had an accepted referral to secondary or tertiary SLaM services. Again, more women in the study cohort had a rejected referral. Over 85% of women had an outpatient attendance, though the study cohort typically missed a greater proportion of planned attendances compared to the matched controls. Twice as many women in the study cohort with an accepted referral were discharged due to failure to engage, compared to matched controls.

Compared to matched controls, women in the study cohort were twice as likely to have a SLaM inpatient admission, and of those admitted, were more likely to have a greater number of admissions and longer inpatient stays. Almost one-fifth of women in the study cohort were sectioned under the Mental Health Act 1983 and three times as many were sectioned by police, compared to matched controls.

**Table 5.2: Characteristics of SLaM service use among the study cohort (n = 2137) and the matched controls (n = 17,096)**

| Characteristics of service over the observation window (1 January 2005 to 31 March 2020) | Frequency (%)[a] or Median [25%, 75% quantile] among women using SLaM services | |
|---|---|---|
| | Study cohort (n = 2137) | Matched controls (n = 17,096) |
| **Follow-up time** | | |
| Time from first SLaM contact to 31st March 2020 or death | 10.63 [7.01, 13.19] | 10.59 [6.99, 13.16] |
| **IAPT** | | |
| Any accepted referrals | 1012 (47.4) | 9210 (55.2) |
| Median number of accepted referrals per woman | 2.00 [1.00, 3.00] | 2.00 [1.00, 3.00] |
| Any rejected referrals | 301 (14.1) | 1612 ( 9.6) |
| Ever discharged from an active referral due to failure to engage (among those ever accepted to IAPT) | 767 (75.8) | 5691 (61.8) |
| Any IAPT attendance | 748 (35.0) | 7598 (45.4) |
| Median proportion of planned IAPT attendances that were missed or cancelled (per woman) | 0.33 [0.00, 0.50] | 0.22 [0.00, 0.42] |
| **Secondary or tertiary mental health services** | | |
| Any accepted referrals | 1817 (85.0) | 14287 (83.7) |
| Median number of accepted referrals per woman | 3.00 [1.00, 5.00] | 2.00 [1.00, 3.00] |
| Any rejected referrals | 726 (34.0) | 4130 (24.5) |
| Ever discharged from an active referral due to failure to engage (among those ever accepted to secondary/tertiary services) | 712 (39.2) | 2874 (20.1) |
| Any outpatient attendances | 1847 (86.4) | 14882 (86.7) |

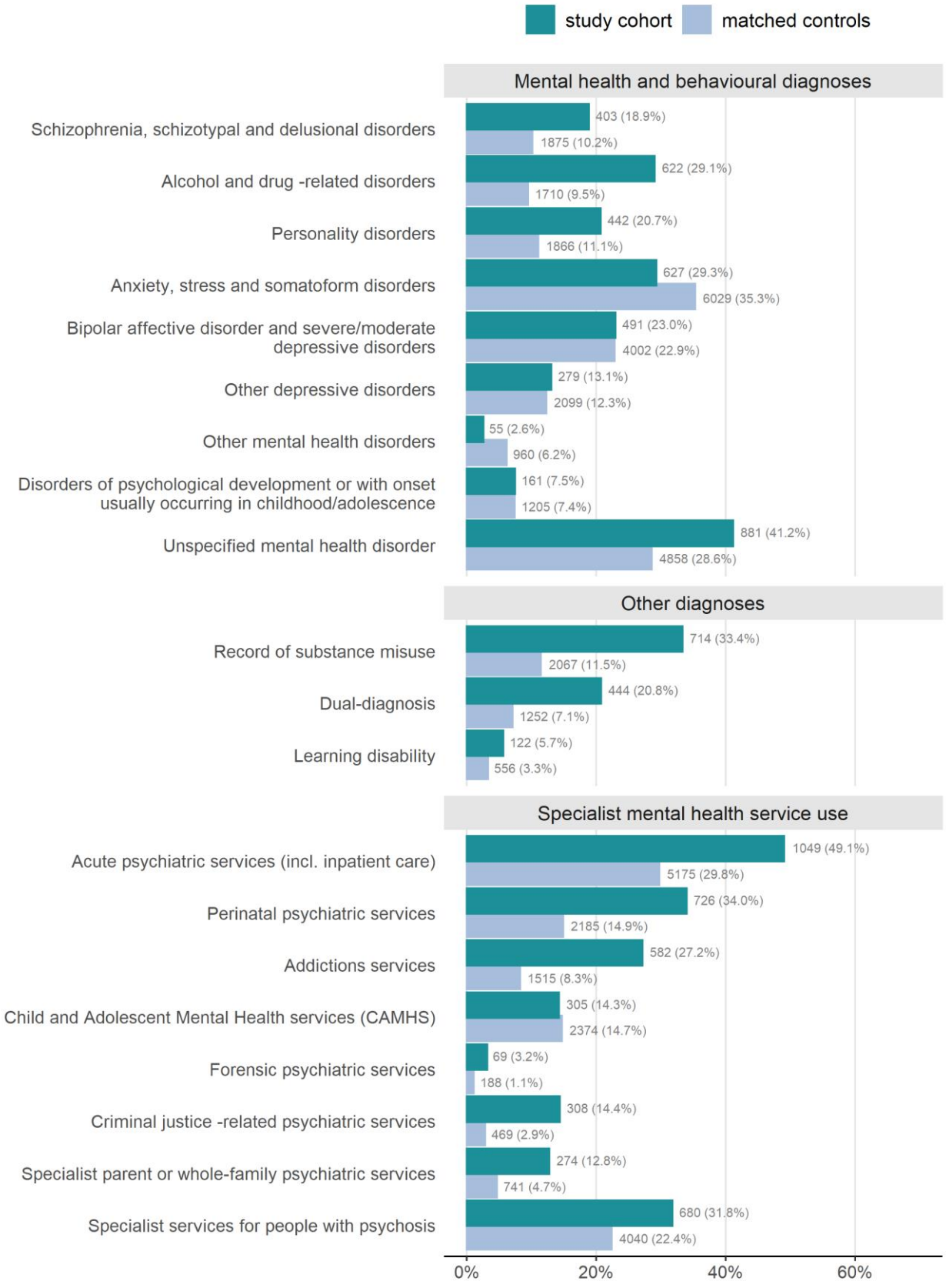
| | | |
|---|---|---|
| Median proportion of planned outpatient attendances that were missed or cancelled (per woman) | 0.17 [0.09, 0.28] | 0.11 [0.00, 0.25] |
| Any SLaM inpatient admissions | 582 (27.2) | 2373 (13.4) |
| Median number of admissions per woman | 2.00 [1.00, 4.00] | 1.00 [1.00, 3.00] |
| Median average length of inpatient stay (days) per woman | 27.00 [11.30, 52.30] | 23.00 [8.00, 52.00] |
| Ever sectioned under the Mental Health Act 1983 | 404 (18.9) | 1287 (7.2) |
| Section 135 or 136 (i.e., police) | 226 (10.6) | 530 (3.1) |
| Section 2 or 3 (i.e., assessment or treatment) | 331 (15.5) | 1081 (6.0) |
| Sections related to criminal justice[b] | 15 (0.7) | 34 (0.2) |

[a] age-standardised rates are presented in brackets '()' for the matched controls, with the study cohort as the reference population.

[b] sections 35-37, 41, 46-48 of the Mental Health Act 1983

Note: medians are calculated from the subset of women who have ever had the qualifying event.

**Figure 5.6: Prevalence (%) of mental health and behavioural diagnoses, other diagnoses, and specialist mental health service use among the study cohort (n = 2137) and the matched controls (n = 17,096) over the observation window. Age-standardised percentages are given for the matched controls.**



### 5.3.4 Mental health and behavioural diagnoses

Most women in the study cohort (n = 1747, 81.8%) and the matched controls (13,180, 76.8%) had at least one mental health or behavioural diagnosis among the categories. Around half of the women in the study cohort (n = 1096, 51.3%) had diagnoses in two or more categories, compared to two-fifths of matched controls (n = 6599, 38.5%).

Prevalence of anxiety, stress and somatoform disorders, severe mood disorders, and other depressive disorders was similar between study groups (Figure 5.6). Compared to matched controls, twice as many women in the study cohort had diagnoses of schizophrenia, schizotypal and delusional disorders, or personality disorders. I presented 'unspecified mental health disorder' separately from the 'other mental health disorders' category due to its high prevalence. Among women with an 'unspecified mental health disorder' diagnosis, most had diagnoses in other Table 1 categories (study cohort: n = 708, 80.4%; matched controls: n = 3594, 74.0%).

Alcohol and drug -related diagnoses were more prevalent among the study cohort, compared to matched controls. Differences between the two groups were greater for drug-related diagnoses than for alcohol-related diagnoses (Table A 5.2). Slightly more women in the study cohort (n = 705, 33.0%) had a serious mental illness compared to matched controls (n = 5124, 28.9%). Among women in the study cohort, most psychiatric diagnoses were recorded before the start of their index set of care proceedings (Figure A 5.4).

### 5.3.5 Substance misuse and learning disability

A third of women in the study cohort had a record of substance misuse, twice as many as in the matched controls (Figure 5.6). A fifth of women in the study cohort had both a record of substance misuse and a non- drug or alcohol-related psychiatric diagnosis, three times as many as in the matched controls. Few women had a recorded learning disability diagnosis.

Further investigation into multiple diagnoses among the study cohort found that one in ten women in the study cohort had a serious mental illness diagnosis, a record of substance misuse, and at least one other mental health disorder diagnosis, over their lifecourse (Figure A 5.5).

Almost a quarter of women in the study cohort (n = 479, 22.4%) had an NDTMS record in the CRIS data. The most common types of substances recorded for women in the NDTMS records

were alcohol (n = 283, 59.1%), cocaine and crack cocaine (n = 272, 56.9%), opioids (n = 224, 46.8%) and cannabis (n = 176, 36.7%). Few women reported using benzodiazepines (n = 57, 11.9%) and other drugs (n = 23, 4.8%). The majority of women (n = 379, 79.1%) with an NDTMS record had substances from two or more of the groups described above recorded. For 319 (66.6%) women with an NDTMS record, the NDTMS record indicated that they had been referred to SLaM substance misuse services prior to the start of their index proceedings.

### 5.3.6 Specialist mental health service use

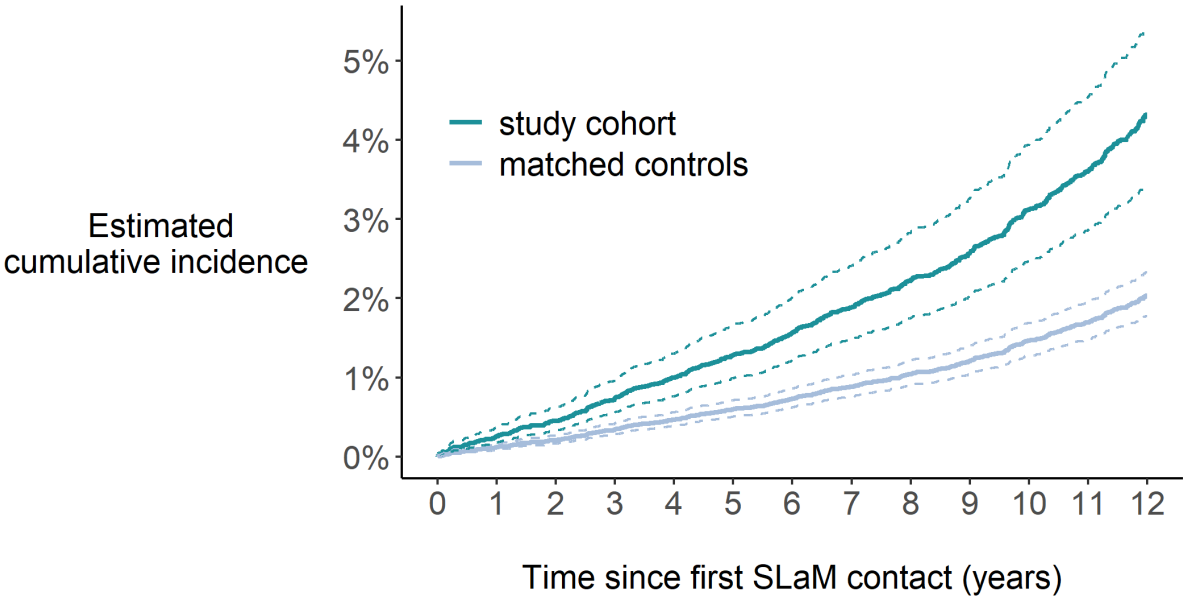
Half of women in the study cohort accessed acute psychiatric services compared with under a third of the matched controls (Figure 5.6). Women in the study cohort were more likely to have accessed SLaM psychosis, forensic, or substance misuse services, and four-times as likely to have accessed SLaM criminal justice-related services, compared to matched controls. One-third of women in the study cohort accessed SLaM perinatal services. Few women in the study cohort (n = 95, 4.4%) accessed the SLaM mother-baby unit.

### 5.3.7 Mortality up to 31st March 2020

Seventy-seven women in the study cohort (3.6%) and 587 matched controls (2.6%, age-standardised) died within the observation window (January 2005 to March 2020). Among women in the study cohort, 75% of women who died were under 48 years old. After performing model checks, the final Cox model included age as a linear effect on death (Figure A 4.1). No influential observations were identified (Figure A 5.3) and the proportional hazard assumption was not violated (Figure A 5.2). Accounting for immortal time bias and adjusting for age at first SLaM contact, women in the study cohort had a 2.15 (95% CI: 1.68 to 2.74) times greater hazard of dying than the matched controls. This was lower when involvement in care proceedings was modelled as a time invariant covariate (1.66, 95% CI:1.30 to 2.12) highlighting that immortal time bias would lead to underestimation of this effect (see Table A 5.1 for full results from the final and sensitivity analysis models). From this model, women in the study cohort who were aged 28 years old at their first SLaM contact had an expected 5-year mortality rate of 1.29% (95% CI: 0.99 to 1.66%), compared to 0.60% (95% CI: 0.51% to 0.71%) for matched controls at the same age (Figure 4.7); the expected 10-year mortality rate was 3.12% (95% CI: 2.47 to

3.94%), compared to 1.46% (95% CI: 1.27% to 1.68%) among the matched controls. Further estimated mortality rates for different ages are available from Table A 5.5.

**Figure 5.7: Estimated cumulative incidence of dying among women, who were aged 28 years old at their first SLaM contact in both the women in study cohort (n = 2,137) and the matched controls (n = 17,096)**



## 5.4 Discussion

### 5.4.1 Key findings

Using the newly linked Cafcass and CRIS data, I have been able to produce the first description of mental health and substance misuse among women involved in care proceedings between 2007-2019 in Croydon, Lambeth, Lewisham, and Southwark. Of the two-thirds of the 3226 women involved in proceedings, the majority had a referral, inpatient or outpatient contact with SLaM before proceedings began, highlighting the high burden of pre-existing mental health and substance misuse need among women attending family court. Over half of women had a formal mental health diagnosis at some point.

Compared to the matched control group, women in the study cohort had higher rates of acute psychiatric service use, including psychiatric inpatient admissions, and being sectioned under the mental health act. They also had higher rates of criminal justice -related and forensic psychiatric service use. Women in the study cohort also had a higher burden of schizophrenia spectrum disorders, personality disorders, and substance misuse.

Twice as many women had a record of substance misuse and a fifth had both substance misuse and a non-substance -related mental health diagnosis indicating high rates of dual-diagnosis. After adjusting for age, women in the study cohort had higher mortality rates.

### 5.4.2 Findings in context

These findings support a growing body of research identifying high maternal mental health need among women involved in care proceedings using routinely collected records.[46,166,167,175] I found higher prevalence of mental health need among women involved in care proceedings than previously reported in Wales.[84] However, this may be explained by my inclusion of all mothers involved in care proceedings, with Griffiths et al describing mothers of infants 'born into care'. I also used linkage to SLaM record to identify mental health need, rather than relying on clinical diagnoses made during hospitalisation or GP contact. I also followed women for over 12 years whereas the study in Wales focussed on diagnoses made in the two years before care proceedings began. In Wales, 40% of women with an infant in care proceedings had a depression diagnosis recorded in the two years before

birth.[175] In this study I split mood disorders into 'severe mood disorders' and 'other depressive disorders' making comparison difficult. Rates of serious mental illness in the Welsh study (defined as schizophrenia spectrum disorders and bipolar affective disorders) were low (4%), however 403 women (12% of 3226) in my care proceedings cohort had a diagnosis of schizophrenia spectrum disorder at some stage. This suggests prevalence of serious mental illness among women involved in care proceedings is higher in South London than in Wales. I also found higher rates of anxiety in South London (627 out of 3226; 19% vs 11% in Wales), which may partly be explained by the impact of proceedings on women's mental health as I captured diagnoses recorded before, during and after proceedings.[61,175]

Finally, I found that women involved in proceedings had higher mortality rates compared with matched controls, adjusting for age. Qualitative evidence about the experiences of women in England following care proceedings describes the 'collateral consequences' of having children placed into care on mothers' material and social support.[61,62] For example, women living in social housing or in receipt of benefits may become ineligible for some welfare payments or become subject to the bedroom tax or even be moved to a smaller council-owned home. [62] Women also often report experiences of social stigmatisation and judgement from friends, family and communities, which compound their own feelings of failure and of loss of their identity as a parent.[61] Women who experience mental health problems and substance misuse problems, are likely to find it difficult to cope with these cumulative stressors. In this study, I did not attempt adjustment for other risk-factors for premature death as I focussed on answering how mortality rates differed between the study cohort and matched controls, rather than what could account for any differences. Previous research into deaths among women whose children entered care in Canada and Sweden found that a positive association between entry into care and death remained after adjusting for other mortality risk-factors.[64,65,67] These studies also used several control group methods in addition to general population controls, including biological sisters and women whose children died. Future linkages in England with other health datasets, including Hospital Episodes Statistics (HES), will be essential to understanding the life-long health needs of women involved in care proceedings.

### 5.4.3 Strengths and limitations

I have addressed several gaps in the evidence by providing a comprehensive, empirical description of mental health service use among women involved in care proceedings in England. Though the SLaM population may vary in terms of population demographics and service availability from other parts of the UK—potentially affecting the generalisability of these findings—both my study and the study in Wales found high rates of mental health need and substance misuse among women involved in proceedings.[84] Another key strength of this study is the use of linked administrative data between public family law and mental health and substance misuse service records.[168] Analyses of routinely collected data offers unique insight into individual-level health service patterns for women with children involved in care proceedings and mitigates common challenges with longitudinal research, such as selection bias, self-reporting bias and attrition.[1,142] However, as data in Cafcass and CRIS are primarily collected for administrative purposes and not research, this study is limited by the scope and quality of available data.

First, it is unclear whether having no diagnosis in CRIS represents no mental health service need, lack of contact with services, or poor recording. It is also possible that clinicians are more reluctant to diagnose patients with complex or stigmatising conditions, such as personality disorders[183] Similarly, I was unable to identify missingness among service use measures.

Second, this study is limited in understanding barriers to SLaM clinical care, such as reasons for rejected referrals and patient disengagement. For example, I could not calculate individual waiting times between referral, assessment, and treatment in these data and so was unable to investigate whether women in care proceedings typically had quicker or slower wait times than the matched controls.

Third, data on wider health services, including GPs and non-SLaM hospitals, were not available as the data linkage only included SLaM service records. For example, women with mental health problems that were adequately treated by GPs would not be represented in this study. Furthermore, changes in substance misuse service provision to non-SLaM providers within the SLaM catchment area over the observation window mean that the prevalence of substance misuse is likely underestimated. Mental health records do not routinely capture physical health issues, or characteristics that impact on health, including domestic violence, and are limited in

their ability to investigate mortality, with no cause of death available. I also had no information about migration out of the SLaM catchment area which could lead to an underestimation of diagnoses and SLaM activity in either group.

Fourth, I was unable to match controls on maternal status. Hospital maternity indicators would allow further investigation into differences in characteristics of SLaM service use, diagnoses, and mortality, which may be partly explained by motherhood. Nevertheless, recent research from Wales, where researchers were able to construct a matched control group of mothers for women in care proceedings with infants, found similar evidence of higher rates of mental health disorders and substance misuse before birth among women in care proceedings.[84]

Finally, women's index set of care proceedings may not have been their first set of care proceedings, as I only had Cafcass data on proceedings between April 2007 and March 2019. Similarly, the CRIS data is only complete from January 2007, therefore, where women had SLaM service use before 2007, this may not have been captured. However, 78.9% of women whose index set of proceedings began between April 2007 and March 2019 had a prior SLaM contact.

As this analysis was conducted using only data on women accessing mental health and substance misuse services, it is possible that this could have introduced Collider stratification bias into the analysis of mortality. For example, referral to SLaM may act as a collider between involvement in care proceedings and other factors associated with mortality (such as self-harm) However, as collider bias typically leads to odd conclusions, such as obesity in hospital patients being associated with reduced mortality rates,[184] it is unlikely that collider bias affected my analyses. Nevertheless, further research is needed to understand the risk among the whole population of women involved in care proceedings, including those not referred to SLaM.

# Chapter 6: Women's trajectories of mental health and substance misuse service use before and after onset of care proceedings

**Chapter overview**

This chapter addressed objective 4b of this thesis:

*to describe the longitudinal trajectories of mental health and substance misuse service use among women before and after onset of proceedings among women in care proceedings who link to a mental health or substance misuse service user record.*

The study cohort included all women whose first recorded ('index') set of care proceedings began between 1 April 2009 and 31 March 2019 in Croydon, Lambeth, Lewisham, and Southwark and who linked to a South London and Maudsley NHS Foundation Trust (SLaM) patient record. I described rates of SLaM service activity in the two years before and the one year following onset of women's index set of proceedings (the observation window), with care proceedings in England lasting an average of 31 weeks. SLaM service activity (including referrals, inpatient admissions, and outpatient attendances) was highest among the study cohort in the 3-month periods before and after onset of women's index proceedings. Conversely, rates of poor engagement with SLaM services, including missing or cancelling outpatient attendances and being discharged from a referral due to 'failure to engage', were lowest in the 3-month periods before and after onset of care proceedings. I used latent trajectory analysis, identifying six longitudinal patterns of inpatient and outpatient service contacts over the observation window among women in the study cohort. In particular, I found that over half of women in the cohort had a trajectory of little or no SLaM service use in the two years before or one year following onset of proceedings, despite two-thirds having a SLaM referral over this period, suggesting high levels of unmet need. This finding supports other research showing that women whose children are at risk of entry into care in England often face multiple barriers to mental health and substance misuse support during children's social care involvement. More generally, this work demonstrates the importance of using different methods to profile women's longitudinal patterns of service use, before and after onset of proceedings, to inform service planning and to generate hypotheses for further research.

## 6.1 Background

My thesis so far provides strong evidence that most women involved in proceedings in the SLaM catchment area (i.e., Croydon, Lambeth, Lewisham and Southwark) experience mental health or substance misuse over their life course and, therefore, are likely to benefit from improved referral pathways between children's social care and mental health and substance misuse services. However, little is known about how and when women access these services in relation to the timing of care proceedings.

Describing women's longitudinal patterns of mental health and substance misuse service use in relation to timing of care proceedings could inform resource planning and service planning within the SLaM catchment within children's social care, family courts, and mental health and substance misuse services. The aim of this study, therefore, was to profile women's use of SLaM services before, during and after care proceedings by describing trends in service referrals, inpatient and outpatient activity, and service non-engagement over time among women with children in care proceedings in the SLaM catchment. I also used Latent Trajectory Analysis to identify common longitudinal patterns of SLaM inpatient and outpatient activity.

## 6.2 Materials and methods

### 6.2.1 Study design

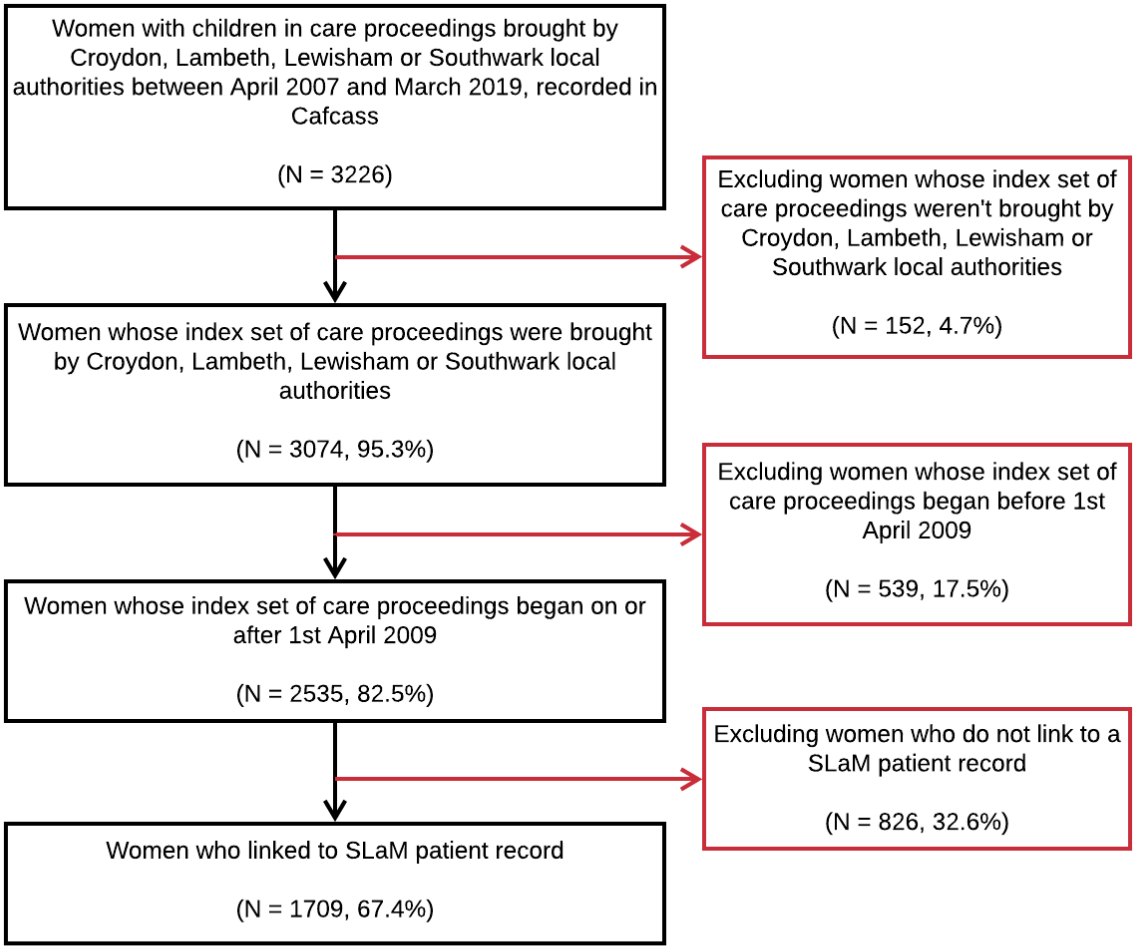
This descriptive study employs a retrospective cohort design with a single study cohort, described below.

### 6.2.2 Study cohort

For this study, I started with the study cohort defined in Chapter 4, further restricting it to only women who linked to a SLaM patient record and whose index set of care proceedings was brought by Croydon, Lambeth, Lewisham, or Southwark local authorities between 1 April 2009

and 31 March 2019. Figure 6.1 shows the study selection flow diagram, with numbers excluded at each step of inclusion/exclusion.

**Figure 6.1: study cohort selection**




* The 'index' set of care proceedings is defined as a woman's first recorded set of care proceedings in Cafcass data.

SLaM = South London and Maudsley NHS mental health foundation trust.

The inclusion/exclusion criteria ensured that women in the study cohort were living in the SLaM catchment area around the time of their index set of care proceedings. Furthermore, CRIS data only captures all SLaM service activity from 1 Jan 2007. Restricting on start date of proceedings therefore ensured that I had complete histories of SLaM service used in the two years before index proceedings began and the one year after index proceedings began for all women I the study cohort. I have referred to this 3-year period as the observation window throughout this chapter.

The study cohort was representative of the Chapter 5 study cohort in terms of age at first SLaM contact (referral, inpatient admission, or outpatient attendance) and ethnicity (Table A 6.1).

### 6.2.3 Measures

#### *Outcome measures*

I used several measures of SLaM service activity to examine longitudinal patterns of service activity across all SLaM services, including the Improving Access to Psychological Therapies programme (IAPT), over the observation window. These measures included:

- service referrals (both accepted referrals and rejected referrals),
- service discharges,
- inpatient admissions, and
- outpatient attendances (planned and attended).

I also derived two further indicators to explore non-engagement with services over the observation window. These included:

- being discharged from a SLaM service due to 'failure to engage', which typically happens where individuals repeatedly miss or cancel appointments; and
- planned outpatient attendances that were not attended due to failure to attend, attending too late to be seen, or patient cancellation.

### 6.2.4 Statistical analysis

#### *Descriptive statistics*

To avoid small counts, I presented the prevalence and frequency of women in the study cohort who experienced a study outcome within each quarter (3-month period) of the 3-year observation window.

#### *Latent trajectory analysis*

Next, I applied latent class mixture modelling (LCMM) to explore heterogeneity among women's trajectories of SLaM inpatient and outpatient activity over the observation

window.[185] The outcome modelled was the total number of days that a woman had a SLaM outpatient attendance or inpatient bed day within each quarter of the observation window. This was modelled as a function of time using natural cubic splines to allow more complex trajectories over time, taking into account the expected fluctuation of health service use in individuals over the observation window. I used the R package `lcmm` to fit the models and functions from the `LCTMtools` package to aid checking model fit.[185,186] I chose to use LCMMs over the comparable latent class growth analysis models. Unlike LCMMs, latent class growth analysis models assume homogeneity among trajectories within a given latent class by setting the variance of the random-intercept and random-slope parameters to 0 (i.e., this type of model assumes that everyone assigned to the same class has the same trajectory).[187] I was guided by the Guidelines for Reporting on Latent Trajectory Studies (GRoLTS) Checklist in reporting my modelling approach and results (Table A 6.2).[188]

I considered LCMMs with up to seven latent classes with an I-splines link function to accommodate the non-normal and highly right-skewed nature of the model outcome (Figure A 6.1).[185] First, I compared one class LCMMs with different link functions to identify the most appropriate link function for these data (Figure A 6.2). The splines link function with three manually specified internal nodes at 1, 3, and 15 days (based on the quantiles of the model outcome distribution) fit the data best (Table A 6.3). Next, I fit the 1-7 class models, specifying at least 10 sets of random starting values to improve chances of model convergence; I increased this number for any models that did not initially converge. The first set of 1-7 class models that I fit did not allow for correlation between the random-intercept and random-slope effects, reducing the number of model parameters that needed to be estimated, improving model parsimony. I later fit 1-7 class models which allowed for correlation between the random effects and class-specific variance matrices, however, none of these models converged. The final model specification is given in Appendix 6, page . I compared model fit of the 1-7 class models using the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC), with a smaller number relative to the other models indicating best model fit (out of all models). I also use several measures to determine absolute model fit.[187,189,190] These included relative entropy, which ranges from 0 to 1 and captures how accurately the model predicts class membership. I also calculated the average posterior probabilities of group membership, per latent class, for each model. If all latent classes have a high average posterior probability

(commonly thought of as > 0.7), this indicates that the latent classes are distinct from one another.[191] Finally, I calculated the odds of correct classification which, if higher than 5 for all latent classes, indicates that model assignment performs better than chance. For more information, an overview of my modelling strategy can be found in Appendix 6, page 272.

### *Assigning women to latent trajectory groupings*

I assigned women in the study cohort to the latent classes identified in the final model using maximum probability assignment.[191] To sense-check the model-predicted trajectories for the model outcome within each latent class, I plotted the median observed trajectories among women in the study cohort together with the model-predicted trajectories and produced descriptive statistics summarising the study outcome measures over the observation window, stratified by latent class assignment.

## 6.4 Results

### 6.4.1 Trends in referrals to SLaM services over the observation window

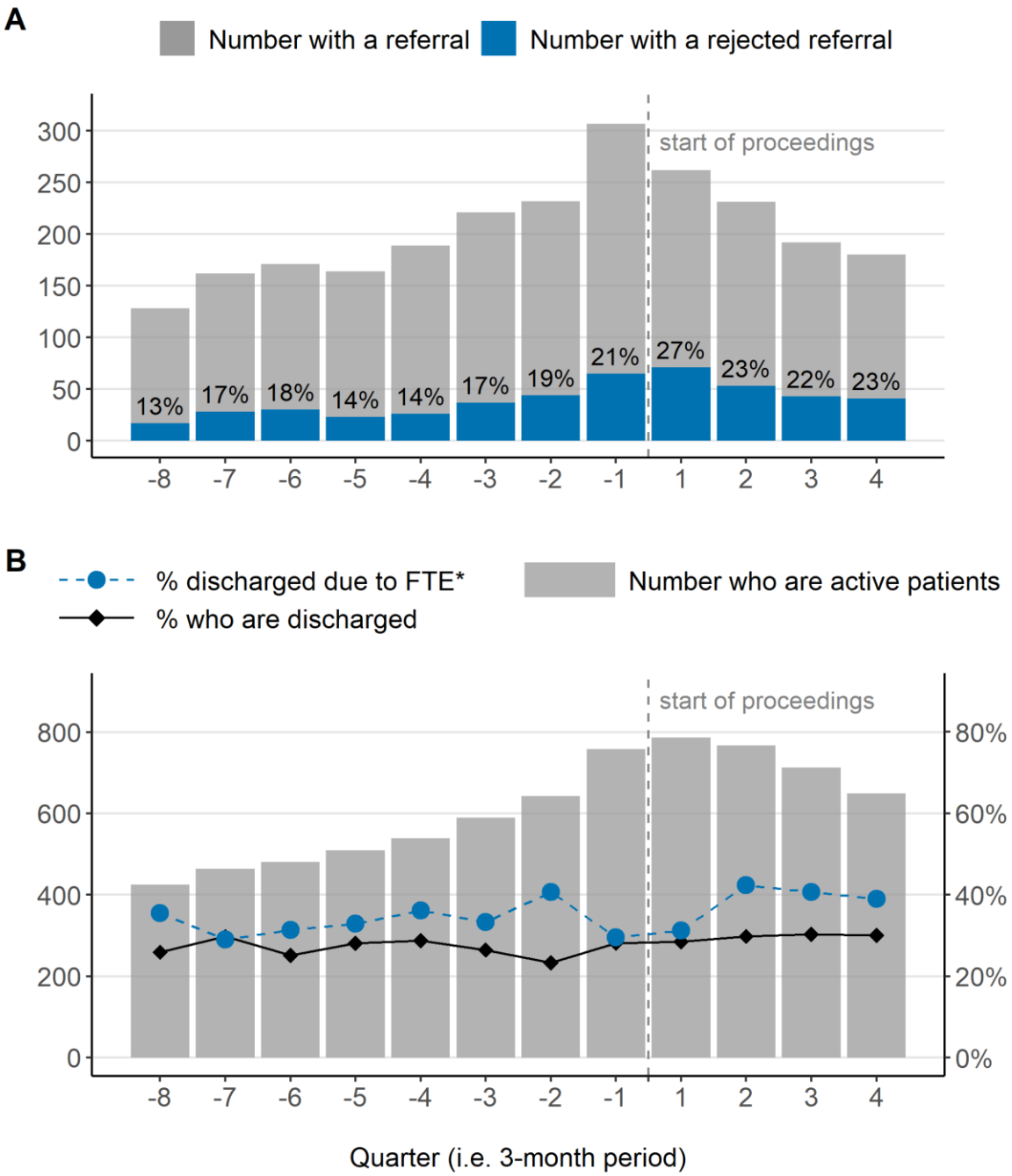
Three-quarters (n = 1243, 72.7%) of the study cohort were referred to a SLaM service over the observation window, among which women had a median of 2 referrals ($25^{th,}$ $75^{th}$ percentile: 1, 3) and 29.4% (n = 365/1243) had a referral rejected. The incidence rate of being referred varied over time (Figure 6.2A).

The number of women in the study cohort with a referral to a SLaM service was highest in the 3-month period before onset of proceedings. The percentage of women referred who had a referral rejected was highest in the 3-month period after onset of proceedings. Trends over time in the proportion of women in the study cohort with an active referral differed by whether the service they accessed over the observation window was IAPT or non-IAPT (Figure A 6.3)

### 6.4.2 Trends in service discharges and 'failure to engage' over the observation window

A third (n = 546, 31.9%) of women in the study cohort were discharged from an active referral due to 'failure to engage' within their 3-year observation window. The percentage of women discharged from a SLaM referral who were discharged due to 'failure to engage' was generally high over the observation window, however, I observed a dip in this measure in the three months before and the three months after onset of proceedings (Figure 6.2B). The percentage of women in the study cohort with an active referral who were discharged for any reason remained stable over the observation period.

**Figure 6.2: (A) Trends over time in the number of women in the study cohort with a referral to a SLaM service, including the percentage of women referred whose referral was rejected; (B) Trends over time in the number of women in the study cohort with an active referral who were discharged, including being discharged due to failure to engage.**




FTE = failure to engage.
* among women who were discharged from an active referral.

### 6.4.3 Trends in inpatient admissions over the observation window

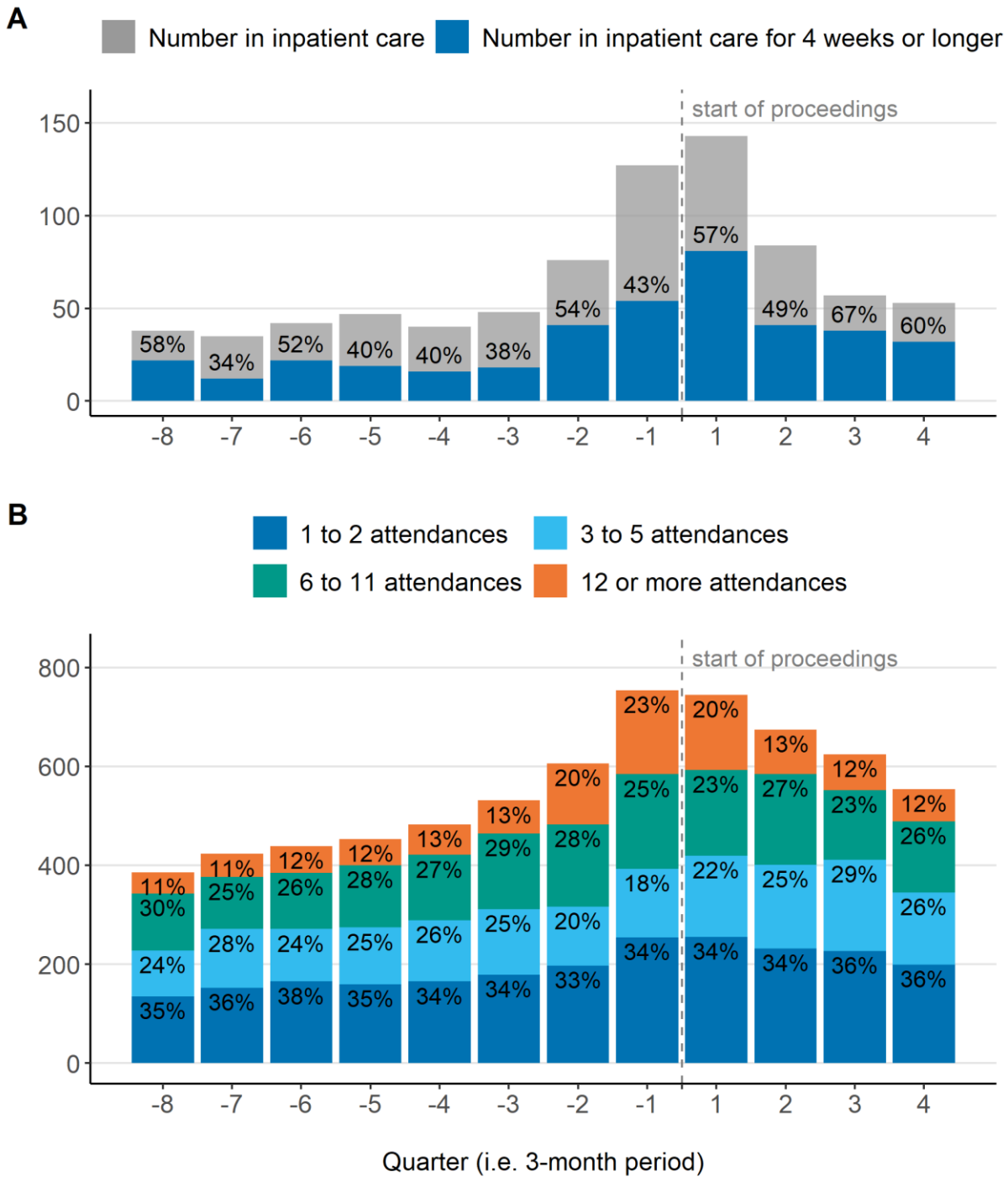
One in six (n = 296, 17.3%) women in the study cohort were admitted to inpatient care at least once over the observation window. Among those admitted, the median length of a SLaM inpatient admission was 31 days (25th, 75th percentile: 14, 74) and women had a median of one admission (25th, 75th percentile: 1, 2). Figure 6.3(A) showed a large increase in the 3-month periods before and after onset of proceedings, both in terms of the number of women having inpatient admissions and the percentage of women admitted who spent four or more weeks in inpatient care.

As 40.6% (n = 693) of women in the study cohort had an infant (< 1 year old) involved in their index set of care proceedings, I also investigated whether rises in admissions were driven by women with infants (Figure A 6.4). The trend was similar between the two groups, though a slightly larger proportion of women with infants were admitted to SLaM inpatient care in the 3-month period following onset of proceedings, compared to women without infants, likely driven by admissions to SLaM perinatal inpatient services including the SLaM mother-baby unit.

### 6.4.4 Trends in outpatient attendances over the observation window

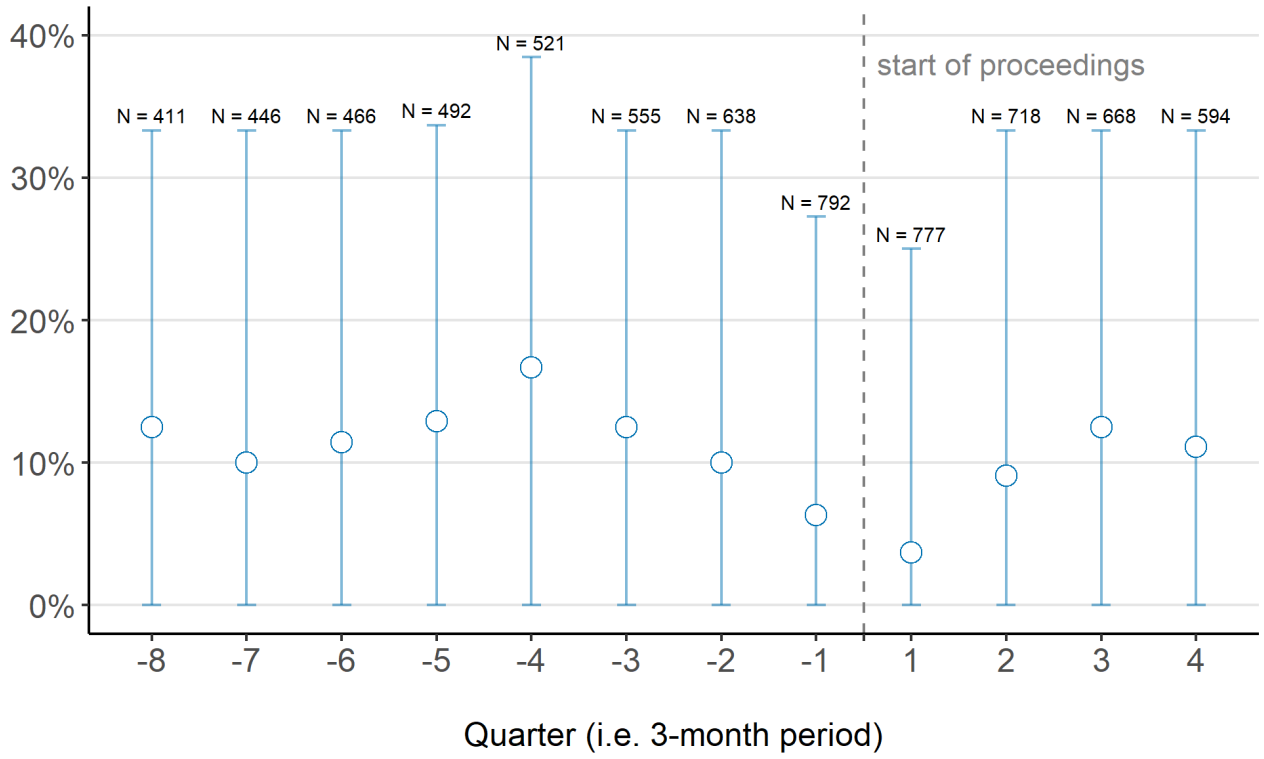
Four-fifths (n = 1334) of women in the study cohort had at least one outpatient attendance with a SLaM service, including IAPT, over their 3-year observation window. Among those with an outpatient attendance, women had a median of 15 attendances ($25^{th}$, $75^{th}$ percentile: 4, 50). Figure 6.3(B) showed that the number of women having outpatient attendances was highest in the 3-month periods before and after onset of proceedings. Women's frequency of outpatient attendances also increased near to onset of proceedings; in the 3-month period before onset of proceedings, half of women with at least one attendance over this period had six or more attendances (i.e., at least fortnightly attendances, on average) and almost one in four had twelve or more attendances (i.e., at least weekly attendances, on average). Few women (n = 466, 27.3%) had IAPT outpatient attendances over their observation window.

**Figure 6.3: (A) Trends over time in the number of women in the study cohort admitted to SLaM inpatient care, by length of stay per quarter; (B) Trends over time in the number of women in the study cohort with a SLaM outpatient attendance, by number of attendances per quarter. Percentages are calculated from the number of women having the event (inpatient admission or outpatient attendance).**



Many women in the study cohort (n = 1083, 63.4%) missed or cancelled at least one planned outpatient attendance over their observation window. Among those with a planned outpatient attendance, women missed or cancelled a median of 15% of their planned attendances (25th, 75th percentile: 4%, 26%). The median percentage of planned outpatient attendances that were not attended was lowest in the 3-month periods before and after onset of proceedings (Figure 6.4).

**Figure 6.4: Trends over time in the median proportion of planned outpatient attendances that were missed among women in the study cohort with at least one planned outpatient attendance in a given quarter, by quarter. Points show the median proportion of planned attendances missed and error bars give the interquartile range (25th to 75th percentile).**



### 6.4.5 Latent trajectory analysis of inpatient admissions and outpatient attendances

#### *Selecting the final model*

Most women (n = 1344, 78.6%) in the study cohort had at least one inpatient admission or outpatient attendance with a SLaM service over their three-year observation window. Table 6.1 presents the relative entropy, AIC, and BIC from the 1-6-class LCMMs; though the 7-class model converged, it assigned no women to one of the seven latent classes, indicating very poor model fit. Guided by these measures, I determined that a 6-class LCMM provided the best fit for the data. The odds of correct classification for the 6-class LCMM ranged from 14.6 to 261.9 and the average posterior probabilities from 0.85 to 0.97, indicating that the model assignment performed better than chance and that the latent classes were distinct from one another (Table A 6.4). Further figures showing the predicted trajectories from the 1-6 LCMMs (Figure A 6.5) and comparing the predicted trajectories to the average observed trajectories after model assignment (Figure A 6.6) are available from the chapter appendix.

**Table 6.1: Diagnostic measures from the one- to six-class latent class mixture models**

| **Number of latent classes** | **Relative entropy** *(closer to 1 = better)* | **AIC** *(smaller = better)* | **BIC** *(smaller = better)* |
|---|---|---|---|
| 1 | - | 41,239 | 41,304 |
| 2 | 0.81 | 40,213 | 40,305 |
| 3 | 0.89 | 38,679 | 38,799 |
| 4 | 0.88 | 38,366 | 38,513 |
| 5 | 0.89 | 37,573 | 37,747 |
| 6 | 0.90 | 37,142 | 37,343 |

#### *Trajectories of inpatient and outpatient activity*

As per Figure 6.5, over half of the study cohort (53.8%) were assigned to the latent class best characterised as the *little or no service use* group. The remainder were assigned to the *sustained service use* group (12.7%), the *service use after proceedings* group (6.6%), the *early to no service*

*use* group (5.6%), the *service use before proceedings* group (8.5%), and the *service during proceedings* group (12.9%).

Table 6.2 provides descriptive statistics of SLaM referrals, inpatient admissions, and outpatient attendances over the observation window among women in the study cohort, by latent group assignment. While it was generally difficult to make comparison between the six groups, due to both the number of groups and small size of some of the groups, women assigned to the *sustained service use* group had particularly high levels of activity over the observation window. Around 50% of women assigned to this group had at least 100 attendances in the two years before and the one year after onset of proceedings with ePJS services (i.e., secondary/tertiary mental health services or substance misuse services), which is an average of 33 attendances per year. In addition, over half the women assigned to this group had inpatient admissions over the observation window. Those with an admission typically had more than one over the observation window and the median length of stay per admission was more than a month. Further work looking at mental health diagnoses and substance misuse, using measure from Chapter 5 (Table 5.1), highlighted that almost 80% of the women assigned to this group had a serious mental illness diagnosis (Figure A 6.7).

Another group that stood out was the *little or no service use* group. Women assigned to this group had very few outpatient attendances over the observation window and just 1% had an inpatient admission. Around a third of women assigned to this group had no mental health diagnoses or record of substance misuse in their SLaM patient record (Figure A 6.7), with lower levels of recorded diagnoses likely driven in part by lack of service use.

**Figure 6.5: The expected trajectories of number of inpatient and outpatient contacts per quarter with mental health services, in the two years before and the one year following the start of women's care proceedings (n = 1,709).**

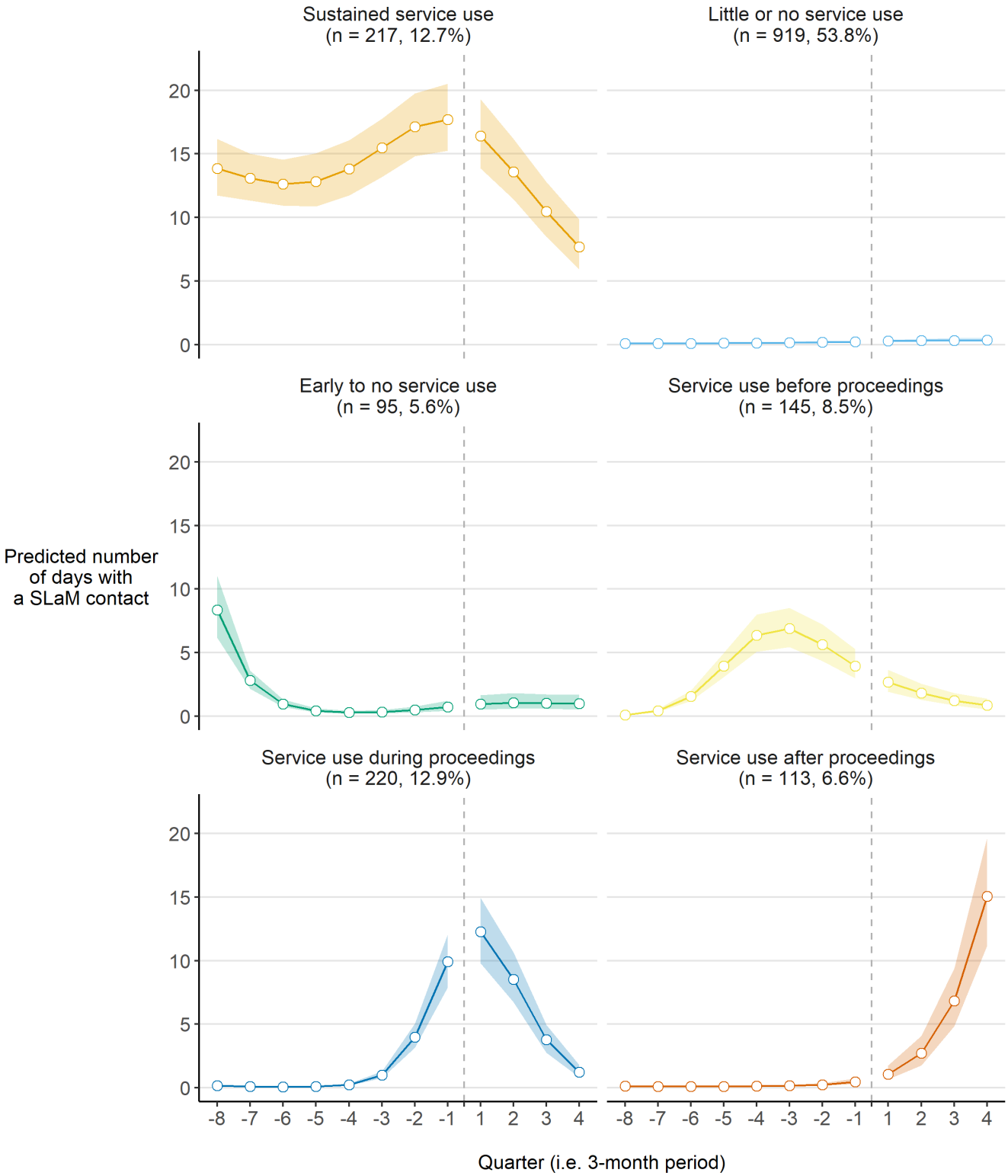


**Table 6.2: SLaM activity over the observation window among women in the study cohort (n = 1709), stratified by latent class assignment**

| SLaM service activity over the observation window | Frequency (%) or Median [25%, 75% quantile] | | | | | |
|---|---|---|---|---|---|---|
| | Sustained service use (N = 217, 12.7%) | Little or no service use (N = 919, 53.8%) | Early to no service use (N = 95, 5.6%) | Service use before proceedings (N = 145, 8.5%) | Service use during proceedings (N = 220, 12.9%) | Service use after proceedings (N = 113, 6.6%) |
| **Timing of SLaM activity:** | | | | | | |
| Time (years) from index proceedings to first SLaM contact | -5.5 [-7.4, -3.6] | -2.3 [-5.7, 0.0] | -5.1 [-7.3, -3.0] | -3.7 [-5.8, -1.7] | -2.0 [-5.8, -0.6] | -2.0 [-4.7, 0.1] |
| Any SLaM contact before index proceedings | 217 (100.0) | 680 (74.0) | 95 (100.0) | 145 (100.0) | 220 (100.0) | 80 ( 70.8) |
| **Referrals** | | | | | | |
| Under active SLaM referral | 180 ( 82.9) | 587 (63.9) | more than 85 | 145 (100.0) | more than 210 | 113 (100.0) |
| Any referral (incl. rejected) | 81 ( 37.3) | 617 (67.1) | 77 ( 81.1) | more than 135 | more than 210 | more than 103 |
| Any referral rejected | 27 ( 12.4) | 177 (19.3) | 25 ( 26.3) | 45 ( 31.0) | 61 ( 27.7) | 30 ( 26.5) |
| Ever discharged due to FTE | 36 ( 16.6) | 284 (30.9) | 42 ( 44.2) | 69 ( 47.6) | 68 ( 30.9) | 47 ( 41.6) |
| **Outpatient attendances:** | | | | | | |
| Any outpatient attendance | 217 (100.0) | 555 ( 60.4) | 95 (100.0) | 145 (100.0) | 220 (100.0) | More than 103 |
| Any ePJS attendance | 217 (100.0) | 434 ( 47.2) | more than 85 | more than 135 | more than 210 | 96 ( 85.0) |
| Number of ePJS attendances | 98.0 [62.0, 133.0] | 3.0 [1.0, 5.0] | 16.0 [8.0, 28.0] | 27.0 [13.0, 55.0] | 30.0 [11.0, 55.0] | 15.5 [6.8, 28.3] |
| Any IAPT attendance | 13 ( 6.0) | 195 ( 21.2) | 20 ( 21.1) | 39 ( 26.9) | 46 ( 20.9) | 45 ( 39.8) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Number of IAPT attendances | 2.0 [NA, NA] | 2.0 [1.0, 4.0] | 1.0 [NA, NA] | 2.0 [NA, NA] | 2.0 [1.0, 5.8] | 5.0 [2.0, 6.0] |
| **Inpatient admissions:** | | | | | | |
| Ever admitted to SLaM inpatient care | 123 ( 56.7) | 13 ( 1.4) | 15 ( 15.8) | 39 ( 26.9) | 83 ( 37.7) | 23 ( 20.4) |
| Number of admissions | 2.0 [1.0, 3.0] | 1.0 [1.0, 1.0] | 2.0 [1.0, 2.0] | 1.0 [1.0, 2.0] | 1.0 [1.0, 2.0] | 1.0 [1.0, 2.0] |
| Length of inpatient stay (days) | 47.0 [21.5, 90.0] | 8.0 [4.0, 14.0] | 18.0 [4.5, 34.0] | 22.0 [11.0, 50.5] | 30.0 [12.5, 67.0] | 46.0 [15.0, 82.0] |

Note: medians are calculated from the subset of women who had the qualifying event over the observation window. Where this subset is < 40 women, the 25th/75th percentiles are not shown; Where the difference between any count and the number of women assigned to the latent class is < 10 with 'more than X' where X is the number of women minus 10; SLaM = South London and Maudsley NHS Foundation Trust.

## 6.5 Discussion

### 6.5.1 Key findings

I found that the incidence of having a SLaM referral among the study cohort was highest in the 3-month periods before and after onset of women's index set of care proceedings than in any other 3-month period over the observation window (i.e., the two years before and one year after onset of index proceedings). However, the incidence of having a referral rejected was also highest over this period, suggesting an increase in inappropriate referrals or referrals that do not meet services thresholds. Further work is needed to contextualise referrals around the time of proceedings onset, to identify opportunities to improve access to SLaM services for women involved in care proceedings.

I also found that the incidence of non-attendance and being discharged due to 'failure to engage' was lowest in the 3-month periods before and after onset of women's index set of care proceedings. This finding raises further questions about whether this reflects a positive improvement in women's engagement with services around this time or whether there were other drivers of improved engagement such as fearing that non-engagement with SLaM services will impact negatively on the outcome of proceedings. Qualitative research into women's engagement with mental health and substance misuse services during care proceedings would help to unpick the reasons behind these changes over time in non-engagement as well as to identify ways in which engagement with mental health and substance misuse services could be improved among this population.

Finally, employing latent trajectory analysis, I was able identify several distinct longitudinal patterns of inpatient and outpatient activity over the observation window, among the study cohort. In particular, I found that over half of the study cohort had little or no inpatient or outpatient activity, raising the question of whether improved access to SLaM services for women in proceedings, such as accelerated referrals or less strict threshold criteria, would enable more women experiencing mental health difficulties or substance misuse to access services. Furthermore, while the aggregate statistics on trends in SLaM inpatient and outpatient activity among the study cohort showed that

more women accessed SLaM services in the 3-months before and after onset than any other time over the study period, the latent trajectory analysis proved a useful exploratory approach to understanding heterogeneity in women's SLaM service use over time.

### 6.5.2 Findings in context

It is likely that the increased SLaM service activity observed in the months immediately before and after onset of care proceedings is partly a result of actions by children's social care and the courts, such as referring women for psychiatric assessments or supporting women to access mental health and substance misuse services for treatment.[49,192] Research has also highlighted the detrimental impact that care proceedings can have on women's mental health and substance misuse, which may lead many to seek support from services such as those offered by SLaM.[61,62]

I also found that, among women in the study cohort with a referral, rates of having a referral rejected were highest in the months immediately before and after onset of proceedings, suggesting an increase in so-called inappropriate referrals over this period. Previous research has highlighted that some women struggle to access mental health services during proceedings due to not being deemed 'ill enough' or experiencing mental health symptoms that don't fit with service eligibility criteria [46,193]

The latent trajectory analysis indicated that over half of women in the study cohort had little or no SLaM service use in the years before and after onset of proceedings, despite two-thirds having a referral over the observation window. Many women who experience mental health illness during the perinatal period report delaying or avoiding accessing mental health services due to the fear it could result in them having their child placed into care.[194] Avoidance of seeking help is likely to be more acute among women from cultural backgrounds where mental illness is particularly stigmatised.

Furthermore, three of the six longitudinal patterns of SLaM inpatient and outpatient activity found in my latent trajectory analysis showed decreased service use in the year following onset of proceedings. This could be explained by several mechanisms. For example, research has shown that care proceedings can be retraumatising for women,

leading them to disengage with support services such as mental health services.[195] Others experience their past trauma being used by local authorities to support the case for their child's placement into care, contributing to a breakdown in trust between women and children's social care professionals that can extend to distrust of other public services including healthcare. In addition, where proceedings result in a child being removed from a woman's care, the stigma, pain and trauma of child loss can have a profound impact on women's ability and motivation to seek help for any healthcare needs.[61,62] Care proceedings and child placement into care have also been shown to have far reaching consequences in women's lives, such as having to move to smaller council housing, loss of benefits linked to children, and loss of social support from family and friends, all of which can impact on regular attendance of appointments.

### 6.5.3 Strengths and limitations

The longitudinal patterns of mental health and substance misuse service use have not previously been described for this population. However, there were several important limitations to this analysis.

First, I was limited to using data collected by SLaM and, therefore, I did not have information about women's use of non-SLaM health services such as GP appointments, psychiatric inpatient admissions to other NHS hospital trusts, A&E attendances triggered by mental health conditions or substance misuse, and non-NHS health service attendances. It is also possible that some women in the study cohort lived outside of the SLaM catchment area at some point over their observation window and accessed non-SLaM mental health or substance misuse services. In this case, I would lack a full history of mental health and substance misuse service use over the observation window. While I was unable to identify how many in the cohort may have incomplete service use histories, women had to have been living in the SLaM catchment area shortly before and during their proceedings, as proceedings are brought by the local authority a child is resident in.

Second, while over half of women were assigned to the latent class indicating little or no inpatient or outpatient activity over the observation window, it was not possible to distinguish between women would have benefitted from SLaM services but faced barriers in accessing them from women who did not require SLaM service use. Similarly, it was

not possible to accurately calculate waiting times between a referral and women's first appointment, to understand if referral waiting lists played a part in low service use, as CRIS data on referrals and appointments do not share a common identifier such as a unique referral identifier. It was also not possible to determine whether the 32% of women in this group who had no psychiatric diagnoses or record of substance misuse had no diagnoses due to insufficient contact with SLaM services or because they did not experience any of these conditions.

Finally, LCMMs are sensitive to model misspecification, particularly among small sample sizes, which can lead to an incorrect number of classes being selected for the final model.[187] For example, I was unable to fit LCMMS that allowed for correlation between the random effects and class-specific variance matrices as they would not converge, likely because my sample size was too small to support the complexity of such a model. It is therefore possible that a larger sample size would have yielded a LCMM with more trajectories than found in my final model, providing further nuance to the larger latent groupings such as the little or no service use group. Nevertheless, the diagnostic measures for my final model indicated that it fit the data well, produced latent groupings that were very distinct from one another, and performed far better than chance in assigning individuals to those groups.

# Chapter 7: Maternal mental health and substance misuse and repeat involvement in care proceedings

**Chapter overview**

In this final analysis chapter, I focussed on women with children involved in care proceedings in the SLaM catchment (Croydon, Lambeth, Lewisham, and Southwark), with prior SLaM service contact, who return to court for multiple sets of care proceedings. I applied survival analysis methods within a predictive model framework to model the time from women's initial set of proceedings to their first return with a new infant. I used these analyses to identify key predictors for returning to court, to inform preventive strategies across children's social care, family courts and health. This work addressed objective 5 of this thesis:

*To identify predictors for returning to court for a further set of care proceedings involving a subsequent infant, that can be measured in the linked family court and mental health service data.*

## 7.1 Background

A 2017 study found that an estimated one in four women with children in care proceedings in England will return to court within seven years for a subsequent set of proceedings.[46] Most (60.3%) returns to court occurred within one year of women's initial set of proceedings ending and more than two-thirds were prompted by the birth of a child following a previous set of care proceedings. Hence, a large number of women return to court with an infant (under one years old) and with little time in between proceedings to address the underlying issues.

The lack of any statutory duty on English local authorities to provide post-proceeding support services to parents may contribute to this 'revolving door' of care proceedings for some women. Once proceedings end, support for birth parents and families often falls away.[46,61] This loss of support can be particularly devastating where proceedings

conclude with children being placed into out-of-home care, for adoption, or with extended family.[161,162,196,197] The trauma and grief experienced by women separated from a child has been likened by some to that of having a child die, except without the ability to find closure due to the possibility of reunification later in childhood or adolescence.[196] Women have also reported experiences of social stigmatisation and judgement from friends, family and communities, which compound their own feelings of failure and loss of identity as a parent.[61] ). In addition, those living in social housing or receiving welfare benefits may find themselves suddenly ineligible for some of their welfare payments as well as being subject to the bedroom tax. In extreme cases, they may even be moved to a smaller council-owned home.[62] As highlighted by this thesis, there are many women involved in proceedings with mental health conditions, substance misuse problems or a learning disability who are likely to find it even more difficult to cope with these cumulative stressors. Furthermore, research from Sweden and Canada has found that women who have children placed into out-of-home care experience higher rates of depression, anxiety, suicide attempts and have higher mortality rates, particularly from so called avoidable causes including suicide, compared to other women with children not placed into care.[64,65,126]

In response to this growing body of evidence a small number of local authorities in England have been able to secure funding to offer specialist support services to women who have children placed into care, though funding is often precarious and demand often outstrips service capacity.[39,41,42] Identification of key risk factors for returning to court would inform strategies to reduce recurrent involvement in care proceedings among this population group, improve parenting capability, and prevent the need for children to enter care. Furthermore, identifying groups at highest risk of returning to court would enable family courts and children's social care to better target these limited services to groups of women who may benefit the most.

The aim of this study was to identify predictors for returning to court with a subsequent infant (i.e., born following onset of women's initial set of proceedings) among women involved in care proceedings who were known to South London and Maudsley NHS Foundation Trust (SLaM) services. Though risk prediction models are primarily used to make individual-level predictions, they can also be used to generate population-level

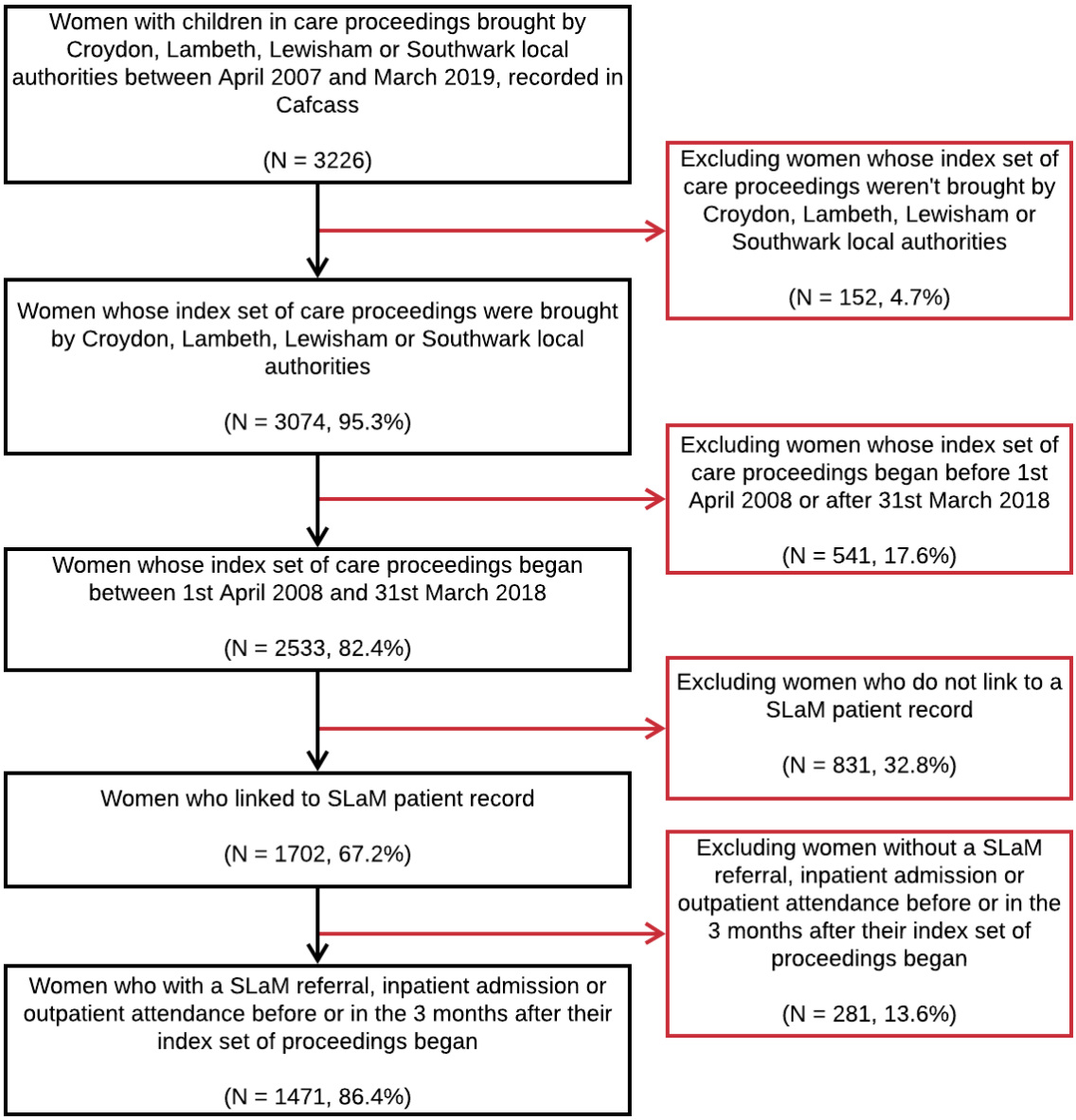
insights to inform policy and decision-making.[198] I used data from the CRIS-Cafcass linkage on women involved in care proceedings between April 2008 and March 2018, brought by SLaM local authorities (Croydon, Lambeth, Lewisham, and Southwark). I included only women with a SLaM referral, inpatient admission, or outpatient attendance prior to their first recorded set of care proceedings to determine risks of returning to court among women with pre-existing mental health or substance use health needs. In particular, I sought to understand whether characteristics of women's prior SLaM service use and healthcare needs predicted returning to court with a subsequent infant.

## 7.2 Methods and materials

### 7.2.1 Study design

This study had a retrospective cohort design whereby I examined time from women's index (i.e., first recorded) set of care proceedings to onset of subsequent care proceedings involving a subsequent infant using a survival analysis.

**Figure 7.1: The study cohort selection flow diagram**



### 7.2.2 Study cohort

The study cohort comprised all women with a set of care proceedings between 1 April 2008 and 31 March 2018 (brought by Croydon, Lambeth, Lewisham, or Southwark local authorities) who had a SlaM referral, inpatient admission, or outpatient attendance before their care proceedings or up to three months after (Figure 7.1).

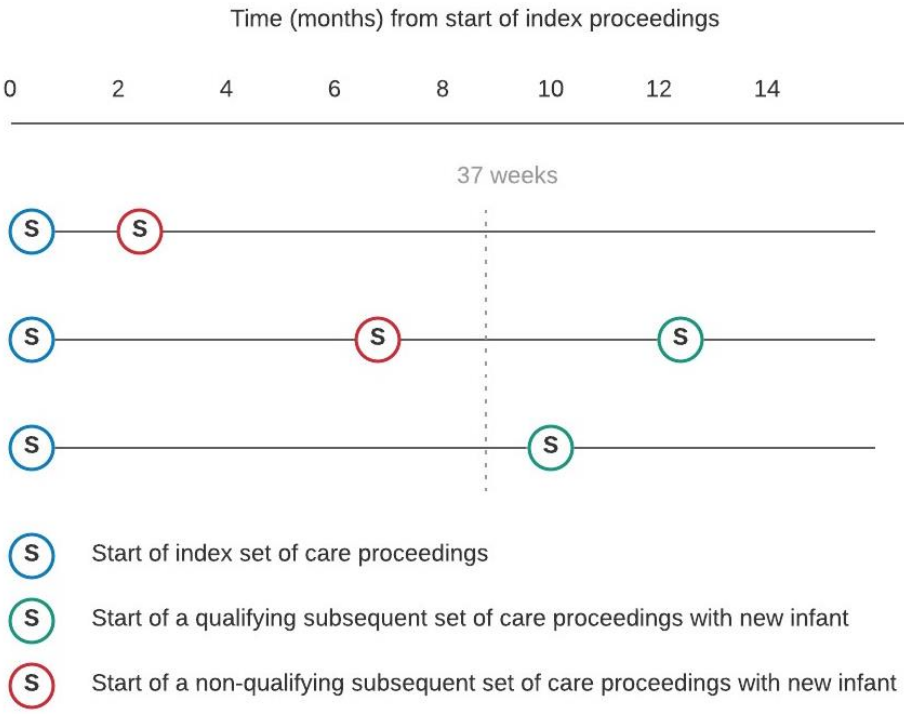
### 7.2.3 Measures

#### *Outcome measures*

**Primary outcome**

The primary outcome was time from onset of women's index set of care proceedings to onset of further care proceedings involving a subsequent infant (i.e., a child aged < 12 months old who was born after the start date of the woman's index set of proceedings), derived from the Cafcass data. Neither CRIS nor Cafcass routinely capture information on pregnancies or births. Therefore, the outcome variable in this study was in fact a combined outcome consisting of 1) having a new child and 2) returning to court with an infant. The subsequent set of care proceedings could have been brought by any English local authority up to 31st March 2019. Returns to court with a subsequent infant that occurred within 37 weeks of onset of women's index proceedings were not counted as I wanted to focus on informing primary prevention services during and after onset of proceedings which often employ strategies including taking a pause from pregnancy. I chose 37 weeks as previous research from Wales showed that 86% of women with infants involved in care proceedings had full-term births (37 to 42 weeks gestation).[84] As women could return to court with a subsequent child more than once, I selected the earliest set of qualifying care proceedings involving at least one subsequent infant per woman (Figure 7.2). Women who did not experience recurrent proceedings were censored at 31st March 2019, the end of the Cafcass data coverage, or at death (recorded in CRIS), whichever was earliest.

**Figure 7.2: Examples of qualifying and non-qualifying outcome events**




### Secondary outcomes

For the purpose of sensitivity analyses, I derived a secondary outcome defined as time from onset of women's index set of care proceedings to onset of further care proceedings involving a subsequent child of any age occurring at least 37 weeks after onset of index proceedings.

### Dealing with consolidated cases

As legal personhood is realized only once a child is born alive under English law (*In Re F (in Utero)* [1988] Fam 122), care proceedings cannot be brought until after a child is born.[199] Where a child is born during care proceedings involving older siblings and the local authority initiates proceedings for the new child, it is common for the two sets of proceedings to be consolidated into one.[200] This is reflected in the Cafcass data.[46] For both outcomes, to more accurately classify returns to court with a subsequent infant, I categorised any care proceedings involving a child born at least 37 weeks after the start of the proceedings, as an instance of returning to court with a subsequent infant, with the

return occurring on the date of birth of the subsequent infant. This ensured that the study outcome would not be severely under counted if there were many consolidated cases. This affected 10 women in the study cohort.

### *Potential predictors*

Table 7.1 describes all potential predictors included in this study, based on definitions used previously in this thesis. Ethnicity was not considered as a predictor due to being too blunt a measure to be readily interpretable. These were all measured at or before the start date of women's index set of care proceedings, except for final legal outcomes of women's index proceedings and ethnicity.

**Table 7.1: Measures included as potential predictors in this study**

| Timing | Measure | Included in modelling |
|---|---|---|
| During index proceedings | Age at start of index proceedings | Yes |
| | IMD at index proceedings from Cafcass, using address recorded at index proceedings | Yes |
| | Age of youngest child at start of index proceedings | Yes |
| | Number of children involved at index proceedings | Yes |
| | Father party status at index proceedings | Yes |
| | Final legal order of youngest child at index proceedings | Yes |
| | LA (Croydon, Lambeth, Lewisham, Southwark) | Yes |
| Recorded between 3 years before to 3 months after index care proceedings began. | Total SLaM inpatient bed days | Yes |
| | Schizophrenia spectrum disorders | Yes |
| | Bipolar/severe depressive disorders | Yes |
| | Anxiety disorders | Yes |
| | Other depressive disorders | Yes |
| | Personality disorders | Yes |
| | Other mental health disorders | Yes |
| | Substance use -related mental health diagnoses | No |
| | Substance types (alcohol, cocaine, cannabis, opioids, other drugs) | No |
| Other | Ethnicity | No |

### 7.2.4 Missing data

A number of methods have been proposed to deal with missing data, including using an 'unknown' category, complete case analysis, and forms of multiple imputation. Using 'unknown' as a distinct category can lead to bias in predictive analyses.[201] However, complete case analysis will not produce biased results when those with missing data do not differ systematically from those with complete data.[138] To understand the bias introduced by performing a complete case analysis, I compared the distribution of the potential predictors and the primary outcome between those with complete records and those with at least one missing value.

### 7.2.5 Statistical analysis

First, I described the distribution of the potential predictors and the outcome among the study cohort using frequencies with percentages for categorical variables and medians with 25th and 75$^{th}$ percentiles for continuous variables. I additionally described the primary outcome, time to returning to court with a subsequent infant, using a Kaplan-Meier cumulative incidence curve, accompanied by a risk table detailing the number of women at risk and the number of women experiencing the outcome, by years since onset of index proceedings.[202]

Next, I modelled the spontaneous hazard of the primary outcome using a multivariable Cox proportional hazards model with complete cases only. The model included all the potential predictors, except for ethnicity and substance-related diagnoses or substance type, with having any record of substances use in the 3 years before to 3 months after onset of inset proceedings (Yes/No) included instead to improve model parsimony (Table 7.1). Due to the expected small number of women in the study cohort who would have died over follow-up, I did not consider death as a competing risk to my primary outcome and instead right-censored women who died before the end of the study period at their date of death.[203] I fit univariable Cox models for all continuous variables and used martingale residual plots to assess whether the final Cox model should include any non-linear effects for these. I assessed the proportional hazards assumption of my Cox model by plotting scaled Schoenfeld residuals for each predictor variable against time.

To assess model calibration (i.e., the accuracy of model prediction), I plotted the proportion surviving to 5 years (without experiencing the primary outcome) against the model-estimated 5-year survival, over time. In addition, I applied bootstrapping with 200 samples to my modelling sample to derive optimism-adjusted predictions and the optimism-adjusted mean square error of predictions.[204] Optimism-adjustment via bootstrapping enables inspection of the impact of model overfitting on the model results, recognising that overfit models produce model diagnostics that are too 'optimistic' and would not accurately reflect the model's performance with new data from the same source population. Therefore, this is a form of internal validation.

To identify how well my final model discriminated between women who did and did not experience the primary outcome over follow-up, I calculated the concordance statistic for time-to-event outcomes (i.e., Harrell's C statistic).[204] A C statistic of 0.5 suggests the model discriminates at random whereas a C statistic of 1 indicates perfect discrimination (i.e., better model performance). Finally, I calculated Somer's $D_{xy}$ rank correlation between predicted survival and observed survival, where a $D_{xy}$ of 0 indicates that the model performs no better than making predictions at random while a $D_{xy}$ of 1 indicates that model predictions are perfectly discriminating.[205] Again, I applied bootstrapping with 200 samples to produce optimism-adjusted values for $D_{xy}$ and repeated this 500 times to derive 95% confidence intervals.

Using my final Cox model, I estimated rates of return between 37 weeks and 5 years from onset of index proceedings among women included in the modelling, for a range of high-risk groups, to explore how the expected cumulative incidence of returning to court changes for women with differing characteristics. I used the Aalen-Johnson method to estimate the rates and the log-log transformation to produce asymptotic 95% confidence intervals.[182,206] All analyses were performed in R using the `survival` and `rms` packages.[181,207]

Though the intention of this analysis was not to create a model for individual-level predictions, it was guided by the Transparent Reporting of a Multivariable Prediction Model for Individual Prognosis or Diagnosis (TRIPOD) statement.[208]

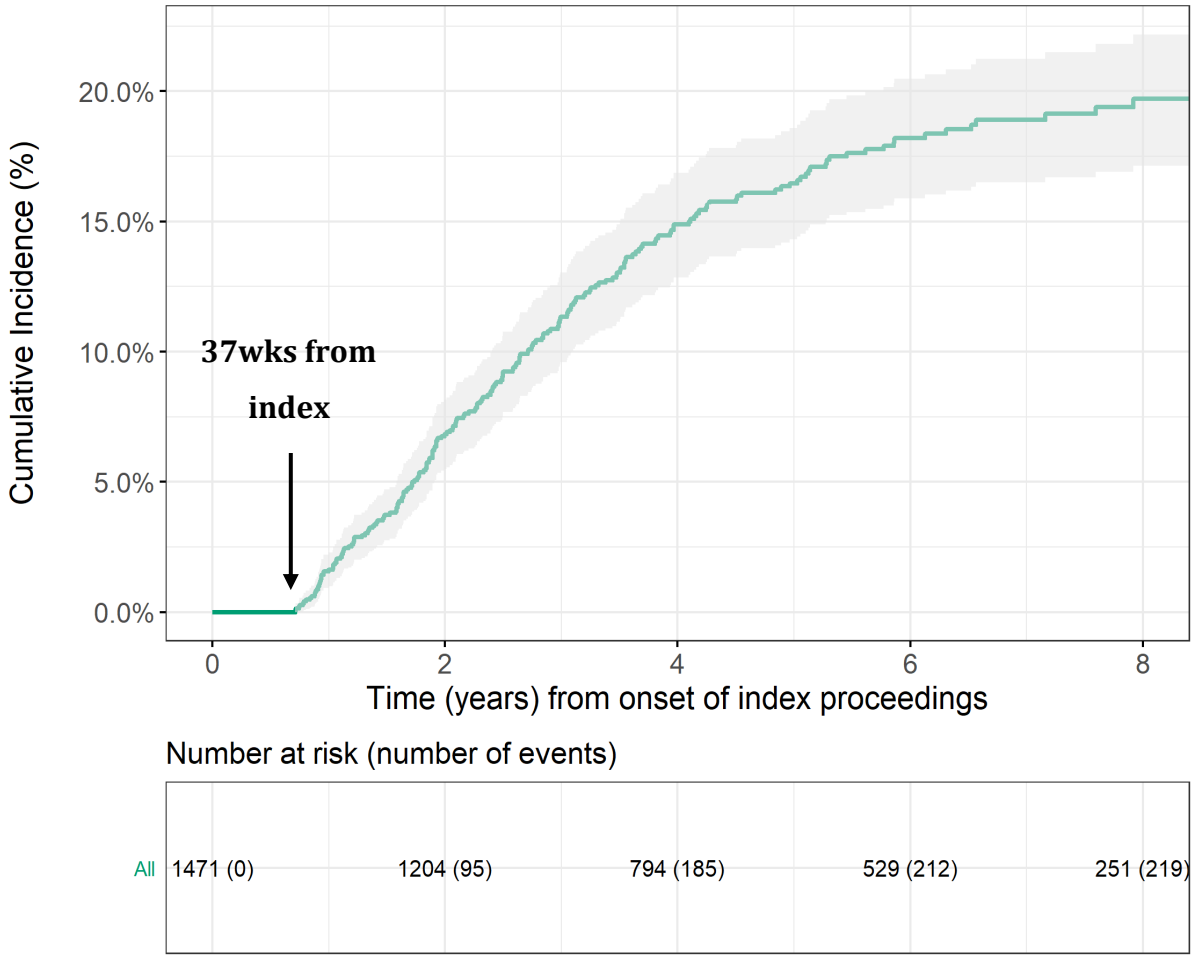
## 7.3 Results

In this chapter I have chosen to focus on women with children in care proceedings with prior contact with SLaM services. However, in the chapter appendix, I have produced statistics on returns to court with a new child among all women whose index set of care proceedings occurred in the SLaM catchment between 1 April 2008 and 31 March 2018 (n = 2533). This includes a breakdown of returns by age of the youngest subsequent child (Table A 7.1) and by linkage status (Table A 7.2). I also plotted the age distribution of subsequent infants (Figure A 7.1).

### 7.3.1 Returning to court

There were 1471 women whose index proceedings were brought by Croydon, Lewisham, Lambeth, or Southwark between 1 April 2008 and 31 March 2018 and who had a SLaM referral, inpatient admission or outpatient attendance no more than three months after their index proceedings started ('the study cohort'). Women in the study cohort had a median of 5.6 years of follow-up, from the onset of their index set of proceedings + 37 weeks to 31st March 2019, or death if earlier. One in six women in the study cohort (n = 252) experienced a return to court with a subsequent child over follow up; 219 (86.9%) involved infants (i.e., the primary outcome). Few (n = 15, 1.0%) women in the study cohort returned with a subsequent infant within 37 weeks of the start of their index proceedings. Women whose index set of proceedings were brought by Southwark (74 out of 412 women, 18.0%) and Lewisham (59 out of 380 women, 15.5%) had higher rates of the primary outcome over follow-up than women whose index proceedings were brought by Croydon (43 out of 309, 13.9%) or Lambeth (43 out of 370, 11.6%).The Kaplan-Meier estimate of the cumulative incidence of returning to court with a subsequent infant (at least 37 weeks after index) suggests that approximately 20% of women in the study cohort return to court with a subsequent infant within eight years of the start of their index set of proceedings (Figure 7.3). The estimated cumulative incidence rose quickly, reaching approximately 7.5% by two years and 15% by four years.

**Figure 7.3: Kaplan-Meier estimate of the cumulative incidence of returning to court with a subsequent infant among the study cohort (n = 1471)**




## 7.3.2 Characteristics of the study cohort and differences between women who did and did not return to court with a subsequent infant

*Individual and case characteristics*

Table 7.2 displays descriptive statistics of women's sociodemographic and case characteristics, among the whole cohort as well as stratified by whether they experienced the primary outcome over follow-up. The proportion of women in the study cohort (3.5%) who later died following care proceedings was similar to that of the study cohort in Chapter 5 (3.3%).

Among women who later returned to court with a subsequent infant, a higher proportion had their index proceedings brought by Southwark than those who did not return (33.8% vs 27.0%) and fewer had their index proceedings brought by Lambeth (19.6% vs 26.1%). Women who returned were also much younger on average than women who did not return, and the age of their youngest child at index proceeding was much younger on average, being a median of 16 weeks old. Recorded ethnicity was similar between the two groups. Just over half of women in the cohort had a child's father party to proceedings. Over two-thirds of the study cohort had their youngest child at index proceedings placed into out-of-home care, placed for adoption, or placed with extended family. Women who returned to court with a subsequent infant were less likely than women who did not to have their youngest child at index placed into care (15.1% vs 24.2%) or to remain or return home (12.3% vs 25.9%). On the other hand, they were more likely to have their youngest child placed for adoption (32.9% vs 12.6%). Missing data for age, ethnicity, IMD and final legal order of youngest child, affected 281 (19.1%) of women in the study cohort.

Overall, 69.5% of women (n = 1022) in the study cohort had their youngest child placed into out-of-home care, for adoption or with extended family at their index set of care proceedings. This was far higher for women who returned to court with a subsequent infant (n = 178, 81.3%) compared to women in the study cohort who did not (n = 844, 67.4%)

### *Mental health diagnoses, substance use, and SLaM service use characteristics*

There was little difference between women who returned to court with a subsequent infant and those who did not in terms of mental health diagnoses recorded within the 3 years before and 3 months after onset of index proceedings, derived from the CRIS data (Table 7.3). However, women who returned to court had a higher proportion of disorders with onset typically in childhood or adolescence and 'other diagnoses', compared to those who did not return (15.3% vs 8.2%). They were also less likely to have had a SLaM inpatient admission in the three years before and 3 months after the start of their index set of care proceedings (16.7% vs 21.8%).

**Table 7.2: Sociodemographic and case characteristics among the study cohort, stratified by whether they returned to court with a subsequent infant or not (primary outcome)**

| | Frequency (%) or median [25th, 75th percentile] | | |
|---|---|---|---|
| Characteristic | Overall (n = 1471) | Primary outcome: No (n = 1252, 85.1%) | Primary outcome: Yes (n = 219, 14.9%) |
| Follow-up time | 5.6 [3.0, 7.7] | 5.2 [2.8, 7.4] | 7.0 [5.2, 8.4] |
| **Local Authority bringing index proceedings:** | | | |
| Croydon | 309 (21.0) | 266 (21.2) | 43 (19.6) |
| Lambeth | 370 (25.2) | 327 (26.1) | 43 (19.6) |
| Lewisham | 380 (25.8) | 321 (25.6) | 59 (26.9) |
| Southwark | 412 (28.0) | 338 (27.0) | 74 (33.8) |
| Died over follow-up | 51 ( 3.5) | Supressed | <10 |
| Age at index proceedings | 31.4 [24.1, 38.3] | 33.0 [25.1, 39.4] | 25.3 [20.3, 29.5] |
| Age (years) of youngest child at index proceedings | 1.9 [0.1, 7.1] | 2.5 [0.2, 8.0] | 0.3 [0.1, 1.4] |
| **Number of children at index proceedings:** | | | |
| 1 | 928 (63.1) | 782 (62.5) | 146 (66.7) |
| 2 | 302 (20.5) | 266 (21.2) | 36 (16.4) |
| 3 | 138 ( 9.4) | 120 ( 9.6) | 18 ( 8.2) |
| 4 or more | 103 ( 7.0) | 84 ( 6.7) | 19 ( 8.7) |
| **Ethnicity:** | | | |
| Black or Black British | 493 (33.5) | 426 (34.0) | 67 (30.6) |
| Mixed | 110 ( 7.5) | Supressed | Supressed |
| Other | 134 ( 9.1) | 122 ( 9.7) | 12 ( 5.5) |
| White | 706 (48.0) | 589 (47.0) | 117 (53.4) |
| Unknown | 28 ( 1.9) | Supressed | <10 |
| Father party at index proceedings | 820 (55.7) | 706 (56.4) | 114 (52.1) |
| **IMD:** | | | |
| 1 (most deprived) | 636 (43.2) | 532 (42.5) | 104 (47.5) |
| 2 | 475 (32.3) | 416 (33.2) | 59 (26.9) |
| 3, 4 or 5 (least deprived) | 194 (13.2) | 156 (12.5) | 38 (17.4) |

| | | | |
|---|---|---|---|
| Unknown | 166 (11.3) | 148 (11.8) | 18 ( 8.2) |
| **Final legal order of youngest child at index proceedings:** | | | |
| Remained or returned home | 351 (23.9) | 324 (25.9) | 27 (12.3) |
| Placed into out-of-home care | 336 (22.8) | 303 (24.2) | 33 (15.1) |
| Placed for adoption | 231 (15.7) | 158 (12.6) | 73 (33.3) |
| Placed with extended family | 455 (30.9) | 383 (30.6) | 72 (32.9) |
| Unknown | 98 ( 6.7) | 84 ( 6.7) | 14 ( 6.4) |

Counts under 10 have not been reported to adhere to disclosure rules. Similarly, where these counts could be derived from row or column totals, at least one other count from both the row and column have been supressed.

**Table 7.3: Mental health characteristics among the study cohort, stratified by whether they returned to court with a subsequent infant or not**

| | Frequency (%) or median [25th, 75th percentile] | | |
|---|---|---|---|
| Characteristics recorded in the 3 years before to 3 months after onset of women's index set of care proceedings | Overall (n = 1471) | Primary outcome: No (n = 1252, 85.1%) | Primary outcome: Yes (n = 219, 14.9%) |
| Any inpatient admission | 309 (21.0) | 273 (21.8) | 36 (16.4) |
| Number of inpatient admissions* | 1.0 [1.0, 2.0] | 1.0 [1.0, 2.0] | 1.0 [supressed] |
| Total number of inpatient bed days* | 19.0 [3.0, 71.0] | 20.0 [3.0, 71.0] | 15.5 [supressed] |
| Any mental health disorder diagnosis or substance use record | 1106 (75.2) | 944 (75.4) | 162 (74.0) |
| **Types of diagnoses recorded** | | | |
| Schizophrenia, schizotypal and delusional disorders | 250 (17.0) | 221 (17.7) | 29 (13.2) |
| Bipolar, severe/moderate depressive disorders | 272 (18.5) | 237 (18.9) | 35 (16.0) |
| Anxiety, somatoform, and stress-related disorders | 297 (20.2) | 260 (20.8) | 37 (16.9) |
| Other depressive disorders | 147 (10.0) | 121 ( 9.7) | 26 (11.9) |
| Personality disorders | 185 (12.6) | 158 (12.6) | 27 (12.3) |
| Alcohol and drug-related disorders | 362 (24.6) | 308 (24.6) | 54 (24.7) |

| | | | |
|---|---|---|---|
| Other psychiatric disorders** | 136 ( 9.2) | 100 ( 8.0) | 36 (16.4) |
| **Number of mental health diagnosis types recorded:** | | | |
| 0 | 375 (25.5) | 316 (25.2) | 59 (26.9) |
| 1 | 528 (35.9) | 452 (36.1) | 76 (34.7) |
| 2-3 | 422 (28.7) | 358 (28.6) | 64 (29.2) |
| 4 or more | 146 ( 9.9) | 126 (10.1) | 20 ( 9.1) |
| **Types of substances recorded** | | | |
| Alcohol | 174 (11.8) | 152 (12.1) | 22 (10.0) |
| Cannabis | 143 ( 9.7) | 119 ( 9.5) | 24 (11.0) |
| Cocaine | 179 (12.2) | 148 (11.8) | 31 (14.2) |
| Opioids | 148 (10.1) | 127 (10.1) | 21 ( 9.6) |
| Other substances | 62 ( 4.2) | 52 ( 4.2) | 10 ( 4.6) |
| **Number of substance types recorded** | | | |
| 0 | 1148 (78.0) | 977 (78.0) | 171 (78.1) |
| 1 | 112 ( 7.6) | 101 ( 8.1) | 11 ( 5.0) |
| 2 or more | 211 (14.3) | 174 (13.9) | 37 (16.9) |
| Both a mental health disorder diagnosis (excluding substance-related disorders) AND a recorded substance type or a substance-related mental health disorder | 208 (14.1) | 179 (14.3) | 29 (13.2) |

* Medians and 25th/75th percentiles are calculated from the subset of women with at least one inpatient admission. Note: 25th/75th Percentiles have been suppressed where the number of women is less than 40.

** Includes disorders with onset usually in childhood and adolescence.

### 7.3.3 Prediction modelling

#### *The final model*

The distribution of the primary outcome and all potential predictors was similar between women with at least one missing value among these variables and women with no

missing values among these variables (Table A 7.3). Therefore, I performed a complete case analysis in all statistical modelling. I additionally excluded any women who died within the first 37 weeks from onset of their index set of proceedings (i.e., before they became 'at risk' for the primary outcome). I included 1189 women (80.8%) from the study cohort, with 186 primary outcome events (and 218 secondary outcome events), in the modelling.

The final Cox model included all variables specified in Table 7.1, with child count included as a categorical variable (with values 1,2,3,4 or more) based on visual assessments of the martingale residual plots for continuous variables (Figure A 7.2). Based on the global proportional hazards test and Schoenfeld residual plots, the proportional hazards assumption did not appear to have been violated in the final model (Figure A 7.3). The concordance over time plot suggested that the model concordance remained high over time (Figure A 7.4) and the calibration plot suggested that the final model predicted the outcome with reasonable accuracy (Figure A 7.5). The final model also discriminated well between women who did and did not experience the primary outcome, even after adjustment for potential model overfitting (Table 7.4).

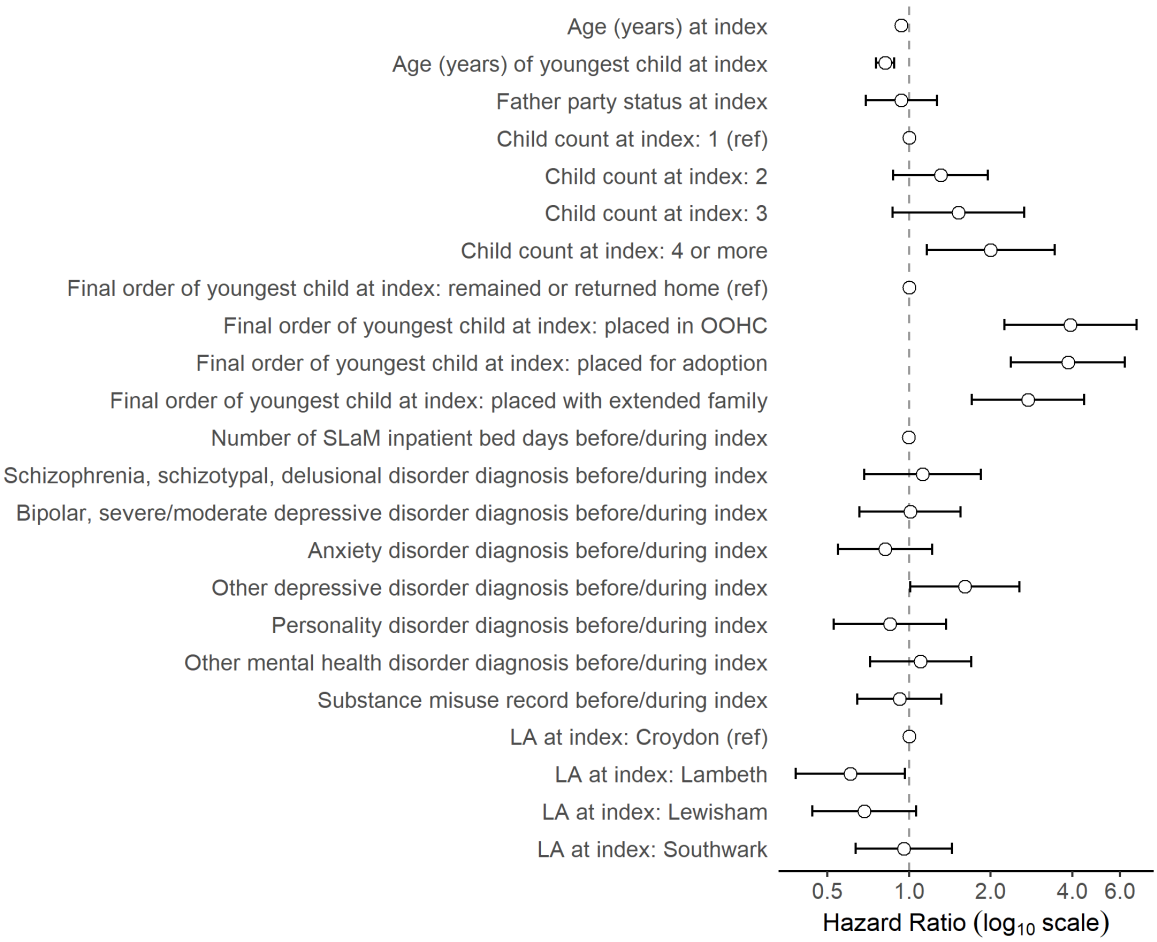
**Table 7.4: Final Cox model measures of model discrimination**

| Measure | Value | Value (optimism-corrected)* |
|---|---|---|
| Somer's $D_{xy}$ | 0.554 | 0.512 (0.506, 0.514) |
| Concordance (Harrell's C statistic) | 0.777 (Standard error: 0.015) | Not available |

*Optimism-corrected values based on 200 bootstrap samples. Confidence intervals based on repeating the calculation of the optimism-corrected values from the 200 bootstrap samples 500 times and calculating the 2.5 and 97.5 percentiles from the 500 optimism-corrected values.

Figure 7.4 presents the model covariate estimates and their 95% confidence intervals from the final Cox model. The final model indicated that being younger at index proceedings (p-value <0.01), having young children involved in index proceedings (p-value <0.01), and having parental responsibility curtailed or terminated at index proceedings (p-value <0.01), were particularly predictive of returning to court. None of the measures related to mental health diagnoses, substance use or psychiatric inpatient care were found to be predictive of returning to court, except for having a mild depressive disorder diagnosis made in the three years before to 3 months after onset of index proceedings (-value = 0.04), which was weakly predictive of the outcome. Having four or more children involved at index proceedings (compared to just 1, p-value = 0.01) and having index proceedings in Lambeth (compared to Croydon) were also predictive of returning to court with a subsequent infant (p-value = 0.04). The full model results can be found in Table A 7.4. Model results were very similar when fitting the Cox model with the secondary outcome (Table A 7.5).

**Figure 7.4: Final Cox model hazard ratios for returning to court with a subsequent infant (n = 1189).**



*Trends in model-estimated cumulative incidence by age at index, age of youngest child and final legal order*

I used the final Cox model to predict typical cumulative incidence curves for women with following values among the predictor variables:

- aged 32 years old at index,
- youngest child at index was two years old
- youngest child at index was placed with extended family,
- had only 1 child involved at index,
- the child's father was party at index,
- zero SLaM inpatient bed days in the 0-3 years before index,
- zero recorded mental health diagnoses
- zero recorded substances used or substance-related mental health diagnoses
- index proceedings were brought by Southwark.

These were selected based on the most common, or median, values for these variables among the study cohort and are referred to as the 'baseline' characteristics below.

Figure 7.5 gives the model-estimated cumulative incidence of returning to court with a subsequent infant among women of different ages at index proceedings. Ages were based on the 10$^{th}$, 25$^{th}$, 50$^{th}$, 75$^{th}$ and 90$^{th}$ quantiles of the distribution of age at index proceedings among women in the study cohort.

**Figure 7.5: Predicted cumulative incidence of returning to court with a subsequent infant for women with baseline characteristics and, varying age at index (based on the final Cox model)**

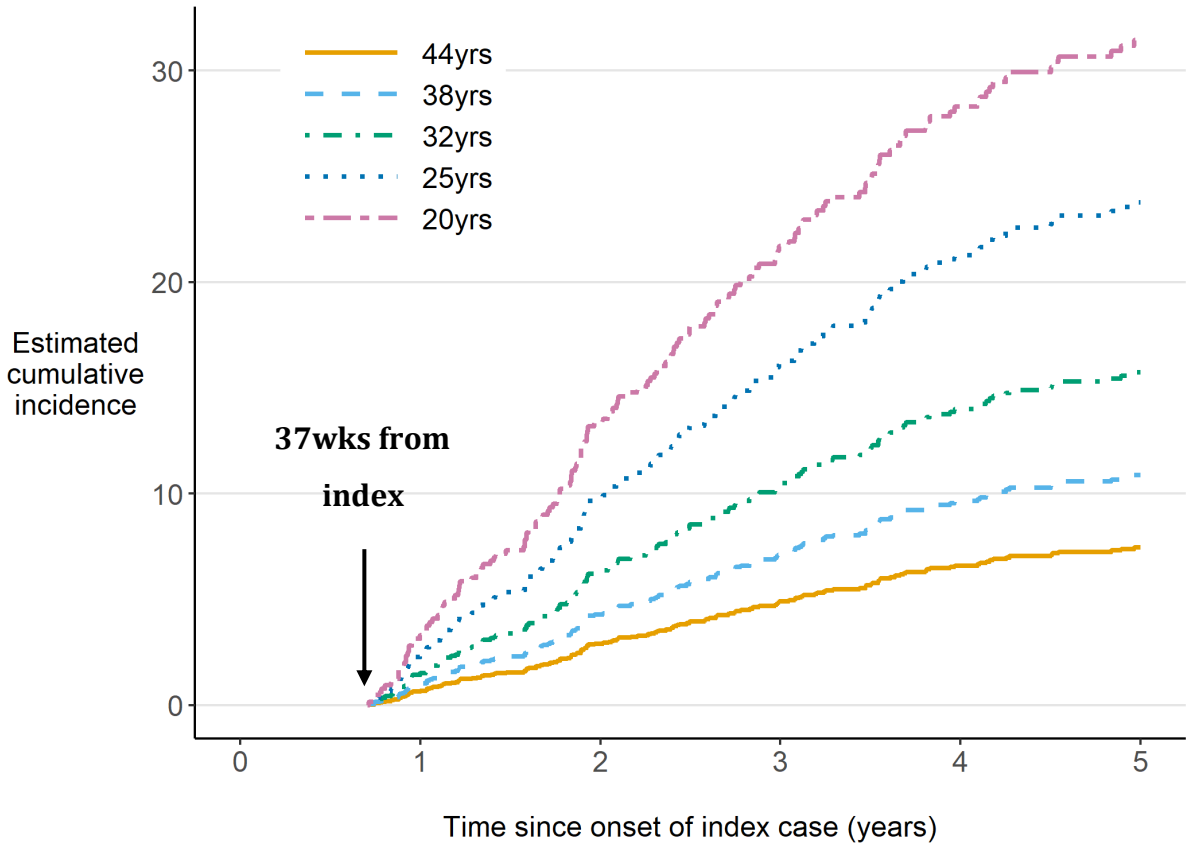



Figure 7.6 gives the model-estimated cumulative incidence of returning to court with a subsequent infant that differ by age of women's youngest child involved at index proceedings. Again, rates were predicted for several values of youngest child age, based on the 10th, 25th, 50th, 75th and 90th quantiles of the distribution of age of youngest child at index proceedings among women included in modelling. This highlights the much higher expect cumulative incidence of returning to court with a subsequent infant among women with very young infants involved in proceedings compared to those with older children. Figure 7.7 gives the model-estimated cumulative incidence of returning to court with a subsequent infant, by type of final legal order their youngest child received at their index proceedings. The expected cumulative incidence is highest among women whose youngest is placed into out-of-home care or placed for adoption. While a number of these curves to do not appear to level off at 5-years, it is likely that they would if data for a

longer time period had been predicted. For example, previous research has shown that the cumulative incidence of returns to court among women in proceedings in England began to level off around 7 years after an initial set of proceedings.[46]

**Figure 7.6: Predicted cumulative incidence of returning to court with a subsequent infant for women with baseline characteristics and, varying youngest age at index (based on the final Cox model)**

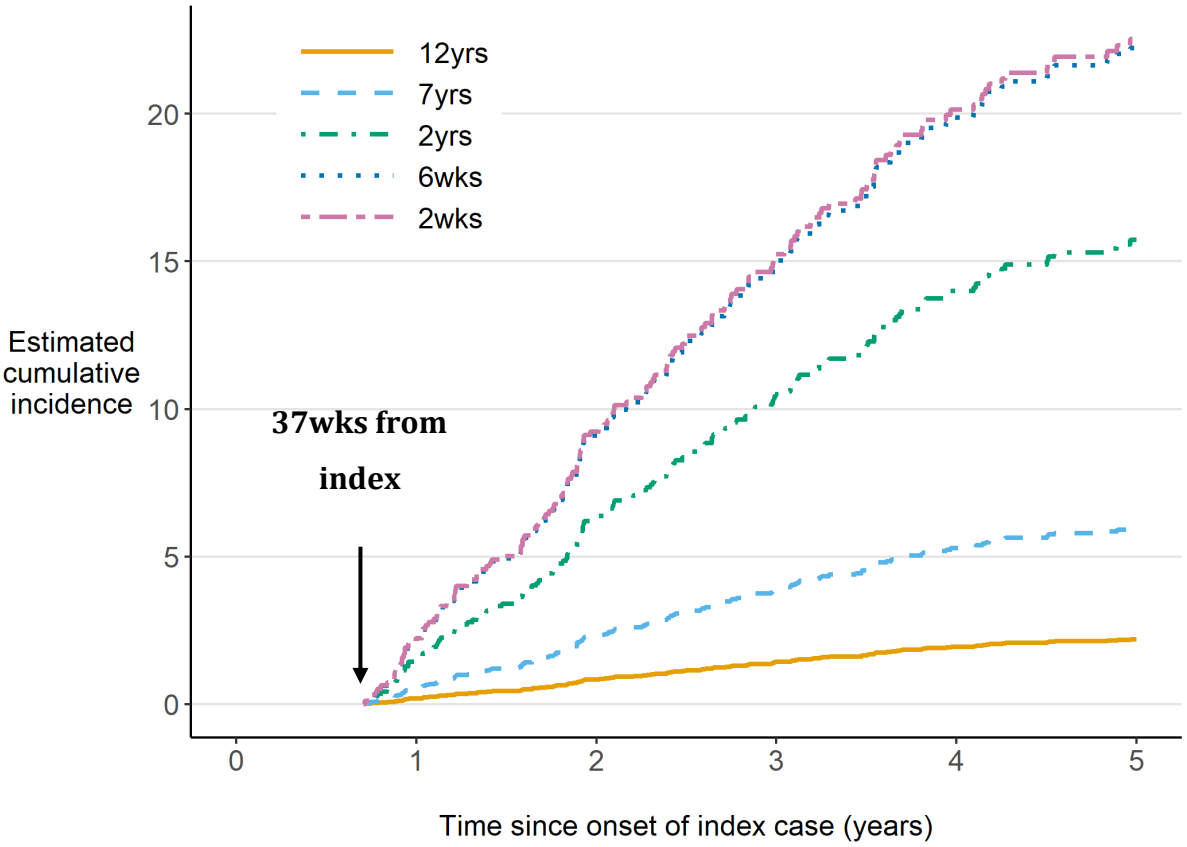
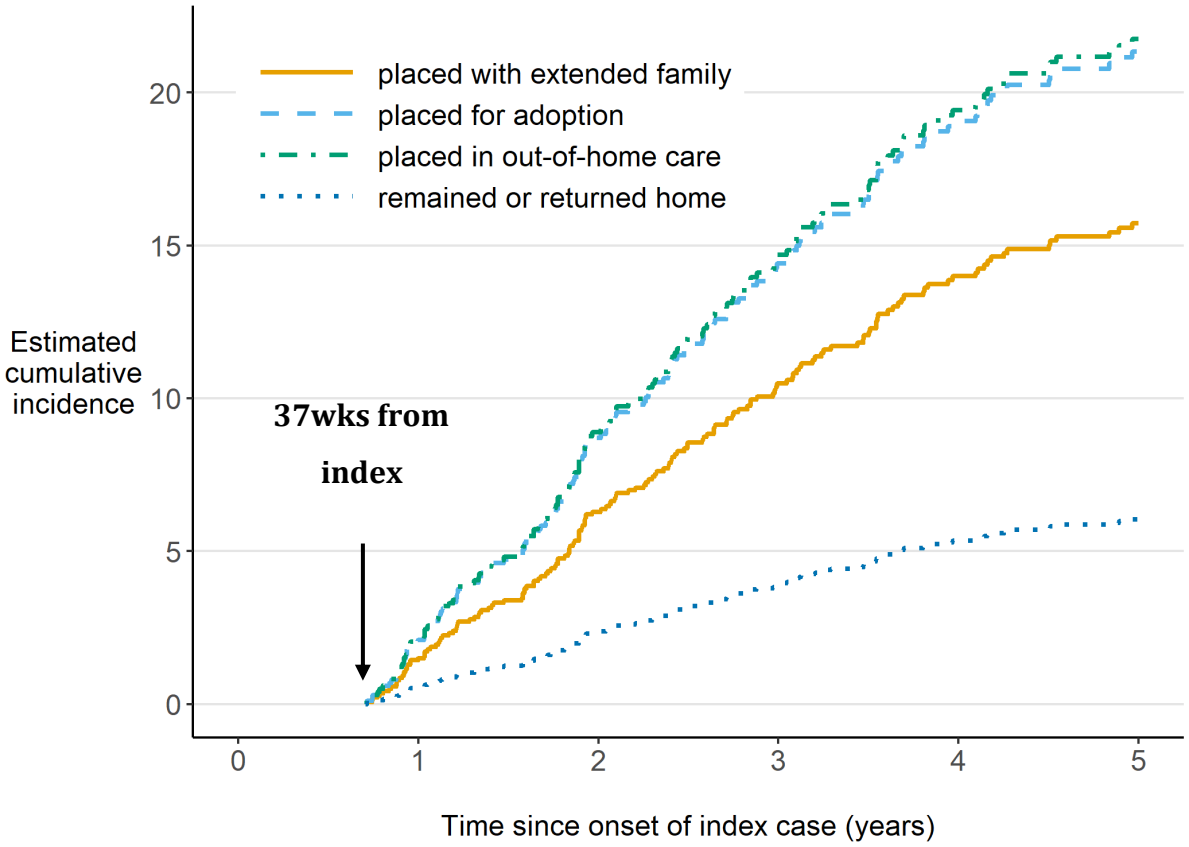


**Figure 7.7: Predicted cumulative incidence of returning to court with a subsequent infant for women with baseline characteristics and, varying final legal order of the youngest child at index(based on the final Cox model)**




*Multiplicative effect of being young at proceedings and having a young child placed into out-of-home care*

To demonstrate the multiplicative effect of two of the most predictive characteristics on the expected cumulative incidence, I estimated the cumulative incidence for a range of maternal ages and youngest child ages, highlighting the much higher expected rates of returning with a subsequent infant among young women with very young children involved in proceedings (Figure 7.8). Here, I used just the 25$^{th}$, 50$^{th}$ and 75$^{th}$ quantiles of age at index and age of youngest child at index among the complete case sample. Next, keeping mothers age at 25 years old, I explored the expected cumulative incidence of returning, varying both the youngest child's age (using 25$^{th}$, 50$^{th}$ and 75$^{th}$ quantiles) and their final legal order (Figure 7.9). These estimates highlight the cumulative impact on

risk of return for young women with a very young child at index proceedings who receives a court order placing them into out-of-home care.

**Figure 7.8: Trends in the model-estimated cumulative incidence of returning to court with a subsequent infant among a woman with baseline characteristics, by age at index and age of youngest child at index**

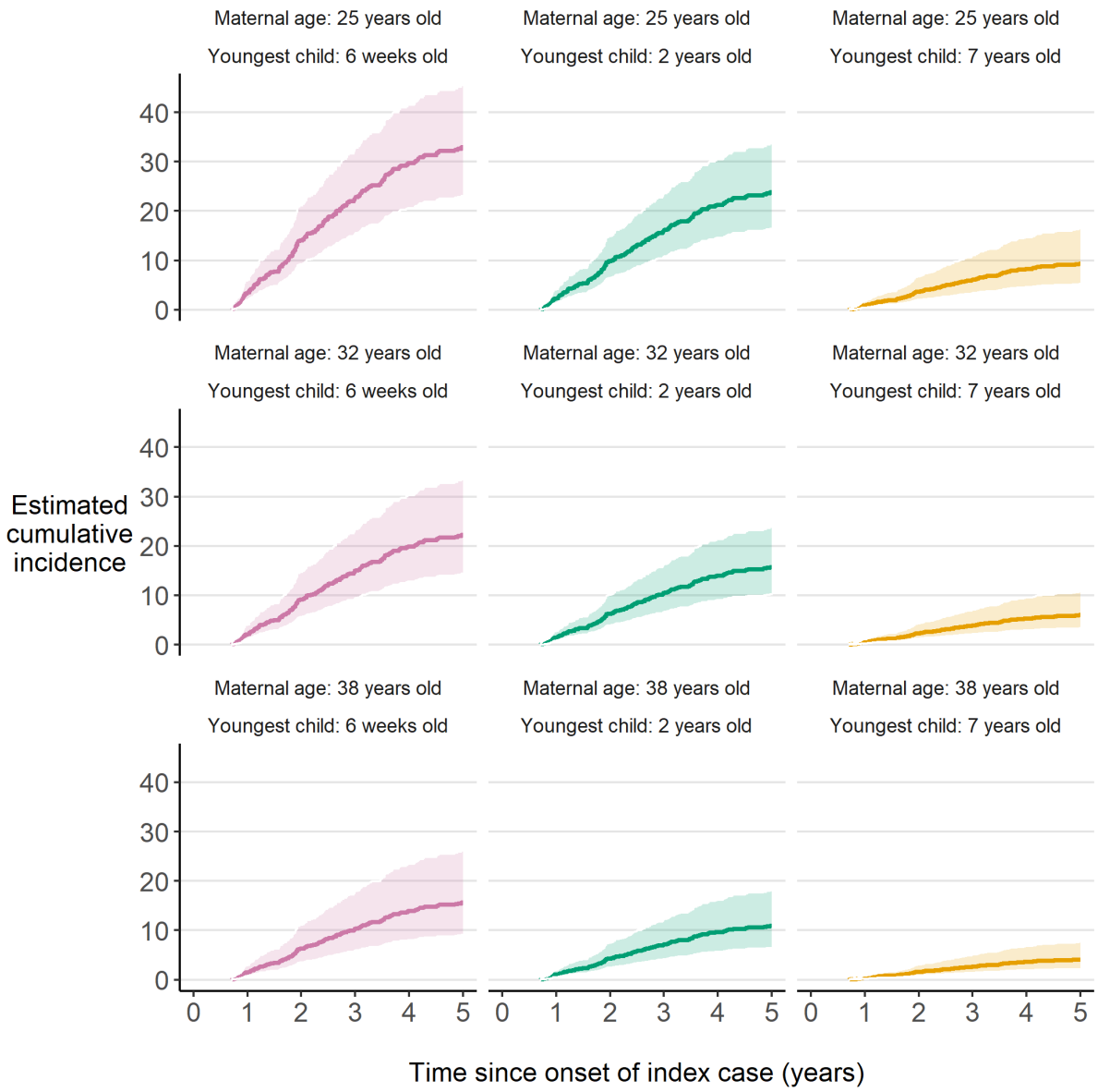
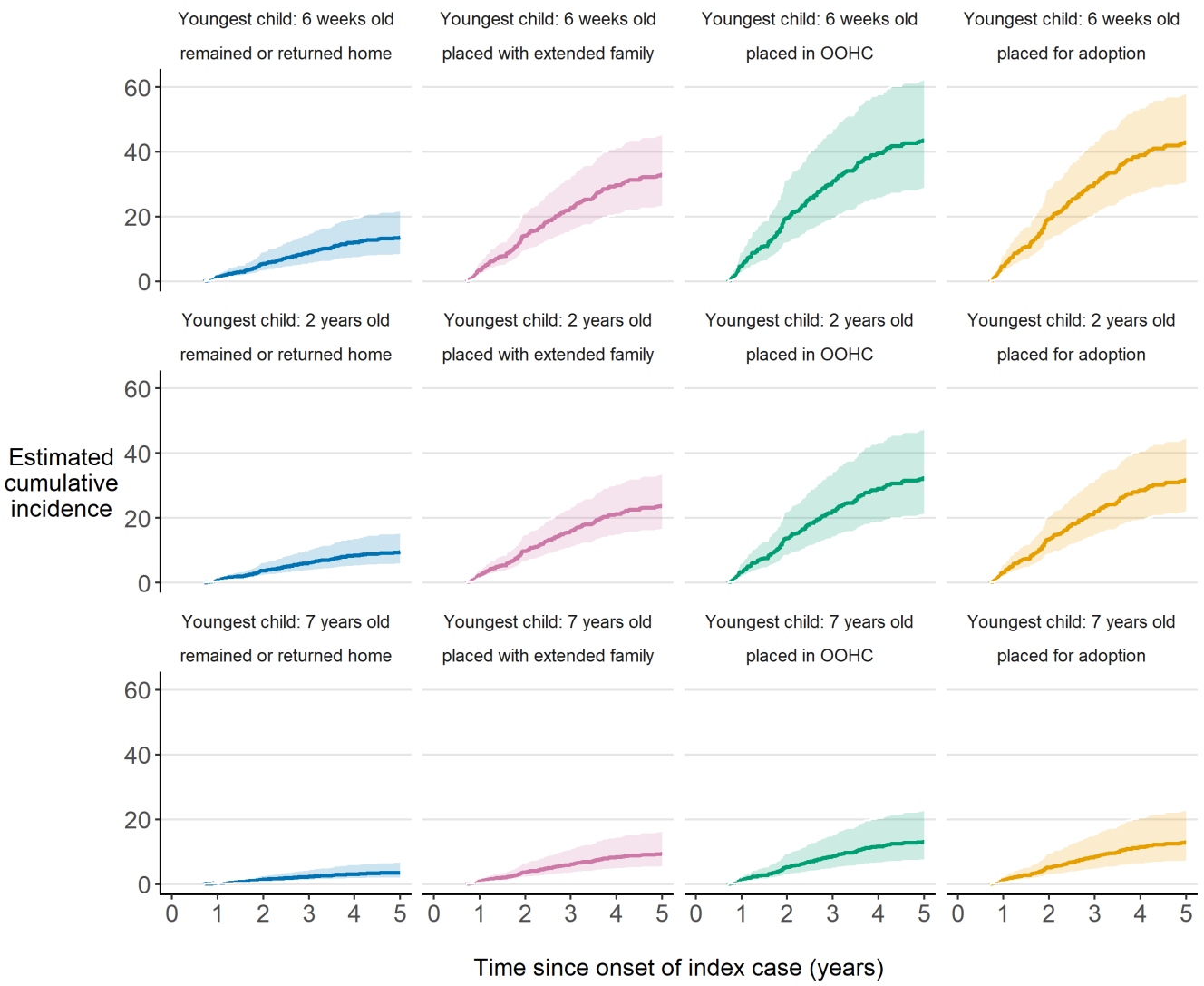


**Figure 7.9: Trends in the model-estimated cumulative incidence of returning to court with a subsequent infant among a 25-year-old woman, with other characteristics held at their baseline values, but varying age of youngest child at index and final legal order of youngest child at index**



## 7.4 Discussion

### 7.4.1 Key findings

An estimated 20% of women involved in care proceedings in the SLaM catchment area between 2008 and 2018, who were known to SLaM before their index set of care proceedings, returned to court within eight years with a subsequent infant. Women who returned to court were more likely to be younger at their index proceedings, to have very young infants involved in their index proceedings, and for those children to be placed for adoption.

Age at index proceedings, age of youngest child at index proceedings and final legal order of youngest child at index proceedings appeared to be the strongest predictors of returning to court with a subsequent infant, of those included in the final model. Indicators of mental health and substance use in the three years before to 3 months after onset of women's index proceedings did not appear to be predictive of returning to court.

The findings suggest that, where service demand outstrips capacity, particular emphasise should be placed on ensuring post-proceeding support services in the SLaM catchment area are available to women involved in care proceedings with a history of mental health problems and substance misuse and who either 1) are young, 2) have very young children involved in proceedings, or 3) have children placed into out-of-home care, for adoption or with extended family at conclusion of proceedings, particularly if any two of these three risk-factors are present.

These findings also highlight that, among women involved in proceedings with a history of mental health problems or substance misuse, type of healthcare needs or severity of needs may not be predictive of whether they will later return to court with a subsequent infant. It appears more likely that returns to court are best predicted by case factors, driven by children's social care and family court practice such as intervening early in infancy and favouring more permanent legal orders.

### 7.4.2 Findings in context

My finding that being young at index proceedings was a key predictor for returning to court aligns with a 2015 descriptive study which used Cafcass data for the whole of England and found that mothers age 16-19 years old had a two-fold higher rate of returning to court within six years than mothers aged 30 and over.[209]

There is also small body of evidence on the concept of replacement pregnancies among women whose children are placed into care and,[174,210,211] compared to older women, younger women who have children removed from their care have more opportunity, in terms of future fertility, to have further pregnancies.

Women in the study cohort whose index set of care proceedings was brought by Southwark or Lewisham experienced higher rates of return than women in Croydon and Lambeth. This could be partly explained by both Croydon and Lambeth operating a family drug and alcohol court, which is a problem-solving court offering a direct route to treatment and support alongside care proceedings for parents with substance use issues as the primary reason for care proceedings being brought.[29] Family drug and alcohol courts in England have been associated with higher rates of reunification and successful substance misuse treatment outcome for parents in proceedings compared to 'business as usual'.[167,212]

### 7.4.3 Strengths and limitations

This is the first study to use linked health and family court data to identify risk factors most predictive of women returning to court with a new child. The final model was internally validated and included measures that are likely to be readily available among children's social care practitioners, collected as part of their case work. However, there are some key limitations to consider.

First, I could not identify which women in the study cohort were actually at risk for returning to court with a subsequent infant as I did not have information on subsequent pregnancies and live births in the data available to me. Therefore, the true risk of returning to court with a subsequent infant is likely underestimated. Similarly, my primary outcome definition may have excluded a small number of women who returned

to court following a preterm birth. I also had no information about subsequent infants who entered care under out-of-court arrangements, though previous research showed most infants entering out-of-court arrangements later end up in care proceedings and therefore would be captured in the Cafcass data.[36] Nevertheless, these findings should inform policy-makers and practitioners in family justice and children's social care and support resource mapping and service development, by identifying high-risk groups of women at the start of care proceedings, before a subsequent pregnancy has occurred.

Second, the measures for mental health diagnoses and inpatient care included in the modelling only capture what is happening in the three years before to 3 months after onset of women's index proceedings. They do not consider changes in health such as new diagnoses or mental health crises in the period between 3 months after onset of index proceedings and the end of their follow-up in the data. Further work with larger cohorts should explore the effect of changes to mental health and substance use before, during and after proceedings to better understand how these may contribute to risk of retuning to court.

Third, in addition, due to the small sample size, measures were fairly blunt in nature and did not capture nuance such as whether women engaged successfully with treatment and the type of services accessed. For the same reason, I did not test for or include any interactions between predictors in the model. With a larger sample size, it would be important to test for the presence of interactions, for example, if experiencing particular mental health conditions or substance use before proceedings modifies the effect of some of the key predictive factors identified in this study. I was also missing a number of important characteristics associated with risk of child maltreatment and therefore involvement in proceedings as I was limited to what is routinely captured in CRIS and Cafcass data. For example, I had no information on intimate partner violence or whether women had themselves been in care during childhood, both of which are known to be prevalent among women who have multiple children placed into care.[46]

Fourth, while it is unlikely that the complete case analysis introduced selection bias, it did reduce the size of the cohort included in the final model which will have led to a loss of power.[138] Future work, could consider performing multiple imputation with chained equations to impute missing values instead of a complete case analysis.

Finally, while the final model has been internally validated, showing good predictive performance, it was not able to be externally validated, for example, by using similar linked data from another geographical population. Therefore, the model findings may not be generalisable to other parts of England. Similarly, as the cohort selection was based on linkage to CRIS, this may have introduced selection bias if women who should have linked but did not (i.e., missed links) differed systematically from women who did link. Therefore, it is possible that the study cohort and the findings are not representative of women involved in care proceedings in the SLaM catchment with prior SLaM contact. Nevertheless, the number of women who were unlinkable due to missingness among their identifiers was small (3.6%).

# Chapter 8: Discussion: summary of findings, limitations, and implications for policy and research

**Chapter overview**

In this final chapter, I summarised findings from each of my five analysis chapters and highlighted their unique contribution to the evidence base on maternal mental health problems and substance misuse among women whose children enter care in England. Drawing upon these findings, I outlined the main limitations throughout and the key implications for policy, practice, and future research.

For this thesis, I performed an ecological analysis to examine whether local prevalence of maternal mental health and substance misuse helps to explain the large variation in rates of entries into care across England. I then explored the use of linked administrative child protection and health data to generate evidence on maternal mental health and substance use needs where children enter care in other settings. Second, I evaluated a new linkage between mental health service records and family court data on women with children subject to family court proceedings concerning placement into care ( 'care proceedings'). Third, using this linked data, I described the type, timing, and severity of mental health problems and substance misuse among women with children in care proceedings, compared to other women accessing mental health services. I also explored common longitudinal patterns of mental health and substance misuse service use among women, before and after onset of their proceedings. Finally, I identified population-level characteristics in the linked data that are predictive of women returning to the family court with further, new children.

## 8.1 Recap of the rationale and aims

Maternal mental health problems and substance misuse are key risk factors for child neglect or abuse and are increasingly common among children in England. Furthermore, large numbers of women have multiple children placed into care over their life course,

with mental health problems and substance misuse a common and often contributing factor. However, there is limited research characterising these maternal health needs, hindering the development of evidence-based policy for improved responses to maternal mental health and substance misuse in the context of child protection. This thesis aimed to address gaps in the evidence via its five objectives.

**Objective 1.** To determine whether aggregate data on maternal health and child entry into care can be used to examine the association between maternal mental health and substance misuse and infant entry into care in England.

**Objective 2.** To explore the existing literature examining maternal mental health and substance misuse among children who enter care using linked administrative child protection and health data sets.

**Objective 3.** To assess the accuracy of a new linkage between family court data and mental health service records for women involved in care proceedings in South London, 2007-2019.

**Objective 4.** To characterise the mental health and substance misuse needs and healthcare use among women in care proceedings who link to a mental health service user record. This objective has two sub-objectives. To describe:

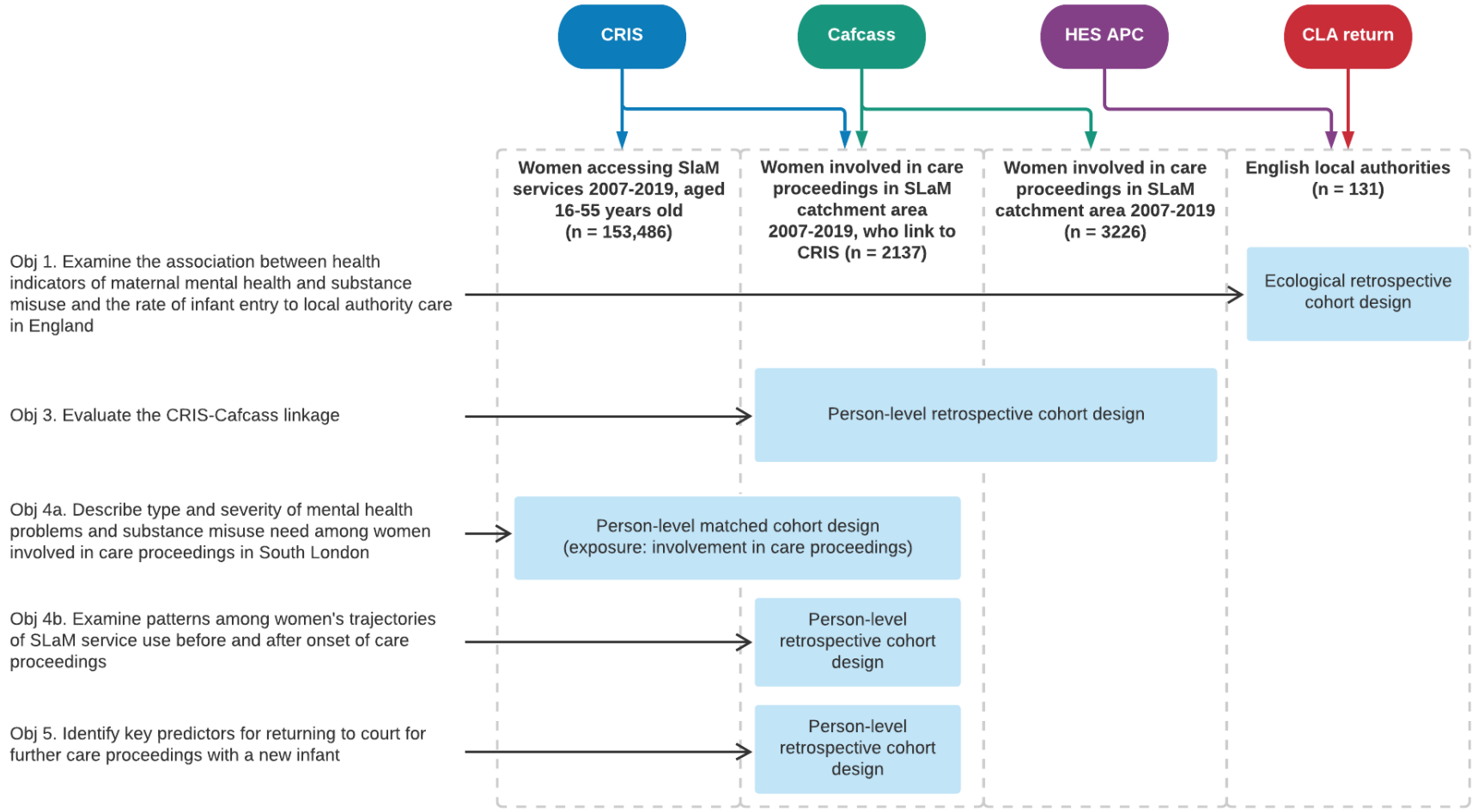
a. Type, intensity and severity of mental health and substance misuse service use; and

b. Longitudinal trajectories of mental health and substance misuse service use before and after onset of proceedings.

**Objective 5.** To identify predictive factors for returning to court for a further set of care proceedings involving a subsequent infant, that can be measured in the linked family court and mental health service data.

Figure 8.1 gives an overview of the data resources and cohorts used in this this thesis. I initially used unlinked national administrative health and children's social care data sets (addressing objective 1), before evaluating and analysing a new linkage between Cafcass data and the South London and Maudsley NHS Foundation Trust patient register for women with children in care proceedings in parts of South London served by the trust (addressing objectives 3-5).

**Figure 8.1: Overview of study cohorts and study design for each thesis aim**




CLA = Children Looked After; CRIS = Clinical Research Interactive Search database; HES APC = Hospital Episodes Statistics Admitted Patient Care; SLaM = South London and Maudsley NHS Foundation Trust

## 8.2 Key findings

### 8.2.1 Findings from aggregate data

**Objective 1.** To determine whether aggregate data on maternal health and child entry into care can be used to examine the association between maternal mental health and substance misuse and infant entry into care in England.

- Local authority prevalence of maternal hospitalisation related to mental health problems, substance use or violence before birth helped to explain an estimated 14% to 35% of the variation in local authority rates of infant entry into care in England between 2006/07 and 2013/14.
- A 1% increase in the local authority prevalence of women experiencing hospitalisation related to mental health problems, substance use or violence before a birth was associated with an extra 2-3 infants per 10,000 in the local authority entering care each year, adjusted for several other local authority -level risk factors for child maltreatment such as local prevalence of teenage motherhood and of maternal deprivation.
- The prevalence and contribution of this measure appeared to be increasing with time, between 2006/07 and 2013/14 (the study period).

### 8.2.2 Learning from data linkages in other settings

**Objective 2.** To explore the existing literature examining maternal mental health and substance misuse among children who enter care using linked administrative child protection and health data sets.

- Several countries and regions have established linkages between official child protection data and administrative health data and used these to examine the interrelationship between child protection intervention and maternal mental health and/or substance misuse.
- Studies using these linkages to examine the interrelationship between child protection intervention and maternal mental health and/or substance misuse have consistently found that:

  - Mothers with a history of mental health and/or substance use related health contacts have higher rates of having a child placed into care
  - Mothers who have children placed into care experience higher rates of mental health and substance use -related health contacts

- There is also growing evidence from Canada and Sweden that women who have children placed into care subsequently experience high rates of anxiety, depression, and premature mortality, particularly from so-called avoidable causes including suicide, compared to other mothers.
- The reporting of linkage rates is generally poor among these studies and as a consequence it proved difficult to appraise the potential for bias to be introduced by linkage error (i.e., false and missed links) and its impact on study findings.

### 8.2.3 Findings from the CRIS-Cafcass data linkage

**Objective 3.** To assess the accuracy of a new linkage between family court data and mental health service records for women involved in care proceedings in South London, 2007-2019.

- Among the 3226 women with a child in care proceedings between April 2007 and March 2019 in the SLaM catchment area, 2137 (66%) linked to a SLaM patient record demonstrating that contact with mental health and substance misuse services is high among this population.
- Manual review of the most lenient links revealed a very small number of false matches (< 5%), suggesting that any linkage error due to false matches would be very small, if any. Similarly, further manual review of 100 random links found evidence to confirm linkage status for 95 of the links and a lack of evidence to confirm (or contradict) linkage status for the remaining. Together, this suggested that the true number of false matches was likely very low and, therefore, the risk of misclassification bias arising from any false matches in subsequent chapters was likely very small.
- However, the quality of person identifiers in the Cafcass data was very poor and a small number of women (< 5%) were unlinkable due to missing both date of birth and postcode history in Cafcass. It was therefore likely there were some missed matches.

- Linkage status was associated with several characteristics including ethnicity, having an infant in proceedings, and curtailed/terminated parental responsibility, as well identifier data quality.

**Objective 4. (A)** To describe the type, intensity and severity of mental health and substance misuse service use among women in care proceedings who link to a mental health or substance misuse service user record.

- At least half (54.2%) of all women with a child in care proceedings in the SLaM catchment area between April 2007 and March 2019 had a formal mental health diagnosis recorded by SLaM at some point and at least 22.1% had a record of substance misuse. At least half (52.3%) had a record of having a SLaM contact (referral, inpatient admission, or outpatient attendance) prior to their first recorded set of care proceedings in the Cafcass data.
- Compared to a matched control group of other women accessing SLaM services, women with a child in care proceedings in the SLaM catchment area between 2007-2019,who linked to a SLaM patient record, experienced higher rates of schizophrenia spectrum disorders (18.9% vs 10.2% matched controls), personality disorders (20.7% vs 11.1%), and substance misuse (33.4% vs 11.5%) over their life course. One in ten had a serious mental illness diagnosis, substance misuse, and at least one other mental health disorder diagnosis, highlighting that many have multiple, intersecting needs.
- Women with a child in care proceedings in the SLaM catchment area between 2007-2019,who linked to a SLaM patient record, also experienced higher rates of acute psychiatric intervention. For example, they were more likely to have a SLaM inpatient admission (27.2% vs 13.4%) or to be sectioned under the Mental Health Act (18.9% vs 7.2%) compared to the matched control group.
- Women with a child in care proceedings in the SLaM catchment area between 2007-2019,who linked to a SLaM patient record, were more likely to be discharged from a SLaM referral due to 'failure to engage' (IAPT:75.8 % vs 61.8%, non-IAPT services: 39.2% vs 20.4%). They also, on average, missed a higher proportion of planned outpatient attendances with SLaM services (IAPT: median proportion missed = 33% vs 22%, non-IAPT: 17% vs 11%) compared to women in the matched control group.

- Finally, women involved in care proceedings who linked to a SLaM patient record had a higher estimated 5 year mortality than those who did not link. For example, a 28-year-old women involved in care proceedings in the SLaM catchment area between 2007-2019 who linked to a SLaM patient record had an estimated 5-year mortality rate of 1.29% (95% CI: 0.99 to 1.66%), compared to 0.60% (95% CI: 0.51% to 0.71%) for 28-year-old women in the matched control group. Similarly, the estimated 10-year mortality rate was 3.12% (95% CI: 2.47 to 3.94%), compared to 1.46% (95% CI: 1.27% to 1.68%) for matched controls.

**Objective 4. (B)** To describe the longitudinal trajectories of mental health and substance misuse service use before and after onset of proceedings among women in care proceedings who link to a mental health or substance misuse service user record.

- Among women whose index (i.e., first recorded) set of care proceedings began between April 2008 and March 2018 and who linked to a SLaM patient record, the number accessing SLaM mental health and substance misuse services and frequency of service use was highest in the 3-month periods before and after onset of proceedings.
- Rates of disengagement with SLaM services — measured using missed/cancelled outpatient appointments and being discharged from services due to 'failure to engage' — were lowest in the 3-month periods before and after onset of care proceedings. Rates of having a referral rejected among those referred was highest in the 3-month period after onset of care proceedings, suggesting an increase in inappropriate or below-threshold-criteria referrals.
- Using Latent Trajectory Analysis to group women with similar longitudinal patterns of SLaM inpatient and outpatient activity service in the two years before and one year after women's index proceedings revealed that an estimated 53% of women had little to no service use over this period. This was despite around three-quarters having a SLaM referral made over the same period, suggesting high rates of unmet need among this population group.

**Objective 5.** To identify predictors for returning to court for a further set of care proceedings involving a subsequent infant, that can be measured in the linked family court and mental health service data.

- Approximately 20% of women involved in an initial set of care proceedings in the SLaM catchment area and known to SLaM services before proceedings began will return to court with a subsequent infant within eight years.
- The majority of infants involved in a return to court were aged 0-1 months old.
- Predictive modelling suggested that (1) being younger at index proceedings, (2) having young children involved in proceedings, and (3) having your youngest child placed into out-of-home care, for adoption or with extended family at conclusion of proceedings were most predictive of returning to court with a subsequent infant.
- Expected cumulative incidence plots, based on my final model, revealed that women with very young infants placed into out-of-home care or for adoption had incredibly high expected rates of returning to court with a new infant, highlighting the multiplicative event of the predictor identified.

## 8.3 Main limitations

### 8.3.1 Size of the linked cohort

The CRIS-Cafcass linkage was limited to data from four local authorities (out of 152 in England), served by the South London and Maudsley NHS Foundation Trust. The size of the linked cohort (n = 2137) is subsequently relatively small, and the data does not capture information on people who leave the SLaM catchment area and access similar services elsewhere. The small sample limited the complexity of questions that can be answered using these data. Furthermore, the SLaM catchment population is not representative of England as a whole, meaning that findings from this thesis may not be generalisable to the rest of England.

### 8.3.2 Potential linkage error

While there is unlikely to be linkage error arising from false matches due to the checks that were performed on links made via the most lenient linkage rule, there is likely to be a degree of

linkage error arising from missed matched. Not only would this underestimate the number of women involved in proceeding who had contact with SLaM services, it could also introduce bias in two main ways. First, when comparing women who linked to women who did not link, misclassification of linkage status due to missed matches could potentially bias associations between linkage status and other measures toward the null (i.e., toward no association). Second, the cohort inclusion criteria in Chapters 5,6, and 7 included linking to a SLaM patient record, which could have introduced selection bias into these cohorts if women with a missed link to a SLaM patient record differed systematically from women with a non-missing link. Therefore, it is possible that the cohorts in these chapters were not representative of women involved in care proceedings in the SLaM catchment with a SLaM patient record. Nevertheless, the number of women who were unlinkable due to missingness among their Cafcass identifiers was small (3.6%).

### 8.3.3 Limitations of administrative data

The CRIS and Cafcass data were collected for clinical and case management purposes, respectively. Therefore, while they are a rich source of data on a traditionally understudied population, data collection was not informed by research plans. Therefore, it is important that quantitative work using these data is complemented by qualitative work to provide context to findings. Furthermore, these data only include service use from SLaM services and where women accessed other services for mental health and substance use needs, such as GP, A&E or other inpatient hospital services, these will not be captured. In addition, CRIS likely captures only those women in proceedings with more severe healthcare needs, for example, some women in proceedings may be adequately treated for mental health problems by their GP. Finally, any biases affecting who gets referred and accepted to SLaM services will be present in the linked Cafcass cohort of women with a SLaM patient record.

### 8.3.4 Data governance limitations

The CRIS data set has also been linked to Hospital Episode Statistics data, which contains information on approximately 97% of live births in England.[86] The original NHS Health Research Authority permissions (CAG and REC), submitted in 2018, covered inclusion of limited information from hospitalisations resulting in live births for women in the CRIS-Cafcass linkage who could be linked to HES via the existing CRIS-HES linkage. This would have enabled

work in Chapter 5 to restrict the control group to women with a live birth in HES (i.e., mothers) and to better define the population at risk of returning to court with a new child in Chapter 7 by identifying women with a subsequent birth, leading to more informative research findings. However, delays in securing permission from NHS Digital (the data controller for HES) to use these data, compounded by delays arising from the Covid-19 pandemic and Covid-19 related NHS Digital data applications taking priority, meant that these permissions were still under review at NHS Digital at submission of this thesis.

## 8.4 Implications for policy and practice

### 8.4.1 Earlier access to mental health and substance misuse services

*Reducing barriers to provide earlier support*

This thesis found evidence of a high burden of mental health problems and substance misuse among women with children in care proceedings in the SLaM catchment. It is therefore likely that earlier treatment for mental health conditions and substance use among parents and parent-to-be would reduce women's risk of having their child placed into care among those experiencing these conditions.[213]

For example, I found evidence that many women with children in care proceedings in the SLaM catchment area with a referral in the two years before and one year after care proceedings had very low SLaM service use. This could partly be caused by long waiting lists to access services. Despite the UK government introducing maximum waiting time standards for mental health services of 18 weeks from referral to first appointment, a 2020 report by the Royal College of Psychiatrists found than an estimated two-fifths of patients waiting for mental health treatment end up in emergency or crisis health services and one in nine end up in A&E.[214] Furthermore, there are often further delays between the initial assessment after referral and the second appointment, which is typically when treatment actually begins. While the UK government has committed to introducing accelerated access to treatment for adults with first episode of psychosis and adults accessing IAPT (Improving Access to Psychological Therapies), this thesis, together with findings from Wales,[83,84] highlights that parents with children's social care involvement would also benefit from accelerated access to mental health services, to support women to access treatment earlier and to help keep more families together. The 18-week

maximum waiting time from referral to first appointment is also at odds with the timeframes of care proceedings, which have a 26-week limit, and is likely to put women at risk of having children placed out of their care without having had the opportunity to receive treatment.

I also found an increase in rejected referrals in the 3-month period following onset of proceedings, suggesting an increase in inappropriate referrals or referrals not meeting service thresholds among women during proceedings. Practitioners delivering case management to women with children in care have also highlighted that sometimes there is a disconnect between mental health service referral acceptance thresholds and social workers' evaluation of women's mental health need, leaving women too well to have their referral accepted but too unwell to safely parent.[12] More research into rejected referrals among women in proceedings would help to ensure that service thresholds are appropriately calibrated to this group, taking into account the unique complexities generated by these family court proceedings.

Finally, almost half of women with a child in care proceedings in SLaM catchment area who linked to a SLaM patient record had an infant involved in proceedings, yet Chapter 5 showed that very few accessed SLaM perinatal mental health services. More widely, there is a lack of specialist perinatal support within mental health services in England and the specialist perinatal mental health services that do exist are frequently under resourced and overstretched.[164] They are also often not able to support women with complex needs and personality disorder diagnosis, which I found to be high among women involved in proceedings and could explain their low use of these types of psychiatric services. In fact, previous research has shown that very few women with infants that enter care in England are placed in mother-baby placements, including mother-baby units, despite evidence of high levels of mental health need among this group.[36] Therefore, it is important that specialist services are adequately funded and resourced to ensure that all women with perinatal mental health problems are given the opportunity to receive specialist support, including mother-baby unit admission.

I also found that women involved in proceedings had high rates of non-engagement with SLaM services compared to other women. While further research is needed to understand the specific barriers women face in engaging with these types of health services, augmenting services to offer a more flexible approach to patient cancellations and non-attendances, such as the assertive outreach approach,[215] may help to reduce rates of non-engagement and improve women's likelihood of successful treatment.

*Better interagency working*

This thesis found that large numbers of women with children in care proceedings had pre-existing mental health or substance misuse needs that are wide ranging and often complex.[84,175] These findings highlight the potential benefits of closer working between adult mental health and substance misuse services and children's social care and family courts. For example, Hertfordshire overhauled their children's social care service with the Family Safeguarding Hertfordshire model, introducing multidisciplinary teams including an adult mental health practitioner and substance misuse practitioner.[133] The Hertfordshire model has since been successfully adopted in several other local authorities.[132] In addition, findings from Chapter 6 indicated that many women who end up in care proceedings in the SLaM catchment will already be well established in mental health and substance misuse services. It is therefore important that services are not further fragmented and that any 'in-house' healthcare provision by children's social care or family courts work closely with women's existing mental health or substance misuse teams to enable continuity of care where possible. For example, a recent qualitative study of women accessing general and specialist perinatal mental health services in England, found that continuity of care helped to alleviate fears among women that disclosing information to unfamiliar practitioners could lead to child removal.[41]

### 8.4.2 Better responses to maternal health need within care proceedings

With high rates of mental health problems and substance misuse among women in care proceedings, there is an argument to be made for more widespread use in the UK of problem-solving family courts that integrate mental health practitioners. For example, currently the only alternative to standard care proceedings procedure are the Family Drug and Alcohol Courts (FDAC), which integrate and provide access to drug and alcohol treatment, as well as mental health practitioners, into the court process where substance misuse is the main cause of care proceedings. The FDAC model has been shown to have a positive effect on family reunification (compared to standard proceedings) and cessation of substance use.[167,212] Policymakers should consider the potential benefits of expanding the eligibility criteria for these courts to include parents experiencing mental health problems (even if they do not have substance misuse problems).

This thesis also highlights that any targeted support services developed for women involved in care proceedings must be equipped to respond to complex and acute mental health need, as well as common mental health disorders and substance misuse. Many women in proceedings in the SLaM catchment experience multiple needs that may not be well served by a specialist service that treats only one type of mental health disorder. Therefore, women in proceedings may benefit from a transdiagnostic approach to mental health service provision, [216] with services that have flexibility in which condition or symptoms they focus on. In recognising multiple needs, any targeted health service provision for this population should be multi-disciplinary and have strong referral pathways across mental health and substance misuse. In particular, the high rate of women with both substance misuse and mental health diagnoses demonstrates a need for dual-diagnosis services among this population, however, current commissioning of substance misuse services in South London from non-SLAM providers has contributed to poorly integrated care models within SLaM,[217] and more should be done to optimise collaboration between these services and SLaM.

### 8.4.3 Improved support after care proceedings conclude

There is no statutory duty placed on English local authorities to provide post-proceeding support services to parents. Consequently, once care proceedings conclude, support for birth parents and families being provided by children's social care services often drops off. In the absence of specialised services, the underlying causes that led to children being removed from their care are likely to persist and, particularly in the case of substance misuse, may leave women simultaneously at greater risk of future pregnancy triggering a return to court and of worsening health.[46]

#### *Reducing women's risk of dying*

In Chapter 5, I found that women with a SLaM patient record and involved in care proceedings in the SLaM catchment area have two-fold age-adjusted mortality rates compared to other women accessing SLaM services. This suggests that women involved in care proceedings and known to SLaM services are a particularly vulnerable group of mental health service use and may be slipping through the net between healthcare services. However, further research is required to determine the causes of higher deaths among this group to inform specific interventions to reduce this outcome.

### *Reducing risk of returning to court*

This thesis supports previous research in highlighting the large numbers of women involved in proceedings who return to court. There is a clear need for nationwide provision of post-proceeding services by local authorities, as highlighted by the sector-led Care Crisis Review in 2018.[3] Drawing upon expertise and testimony from parents and practitioners, the review recommended that post-proceeding services should be able to meet the varied and often highly complex needs of parents whose children are placed into care. Though I did not find any mental health -related predictors associated with returning to court among women involved in proceedings and known to SLaM, this thesis supports the Care Crisis Review's recommendation as I found that many women in proceedings in the SLaM catchment experienced multiple mental health diagnoses and substance misuse over their life course. Currently, availability and design of post-proceeding support varies between local authorities and are often delivered by third-sector providers such as Pause.[146] These services provide critically needed case management support to women, help them to access and navigate other government services, and offer peer-support groups, yet many lack long-term investment from central and local government to develop their services and to meet local demand. They also often lack formal integration of mental health and substance misuse services or accelerated referral pathways to existing NHS services. Given the high prevalence of these health needs among women involved in proceedings, better interagency working between post-proceeding support services and health services would improve women's access to these services and may improve women's engagement with mental health and substance misuse services, which I found to be generally poor.

### *Pre-birth assessment for recurrent mothers*

In this thesis I found that many women returned to court with a new infant born after a previous set of care proceedings and these new infants were typically newborns, indicating swift child protection intervention after birth. Together with qualitative evidence on pre-birth procedure in children's social care, this finding highlights the need to strengthen pre-birth assessment of pregnant women who previously had children removed from their care. Pre-birth assessments play a key role in identifying the services a parent may need to support their parenting capacity and to avoid further child protection intervention. However, previous research suggests that pre-birth assessments are often delayed until the third trimester (i.e., until foetal viability)

which can leave parents with very little time to engage with support services and to make sufficient changes before their child is born.[218,219] The authors of this research suggest that delays are partly attributable to the lack of national guidance on pre-birth child protection procedures in England and call for this to be prioritised. In addition, their findings suggest that overburdened children's social care services may prioritise cases involving older children over those involving only unborn children. Delays can be particularly distressing to recurrent parents who seek support early in pregnancy in the hope that early engagement with services will allow their new child to remain with them.[46]

## 8.5 Implications for further research

In this thesis, I employed exploratory approaches to identify broad groups of need defined by, for example, diagnoses, among women involved in care proceedings. These methods could be applied in future work to address a more clinically focussed area or among a particular subset of women. This thesis also demonstrates that linkage between Cafcass and electronic patient registers from NHS Trusts is feasible and I provide a framework for the establishment and evaluation of similar linkages between Cafcass and data from other NHS mental health trusts employing the CRIS tool for data collection for research. This would enable comparison of this thesis to other local areas to build a more national picture on the interrelationship between maternal mental health and substance misuse and child entry to care in England, as well as to inform further local areas.

### 8.5.1 Identifying barriers and facilitators to mental health and substance misuse service use

My thesis found evidence of high rates of non-engagement with mental health and substance misuse services among women in care proceedings in the SLaM catchment with a SLaM patient record, as well as evidence suggesting many women have unmet SLaM service need around the time of care proceedings. Previous qualitative research from England has described some of the barriers that women often face in accessing mental health services during child protection procedures, such as care proceedings.[39] To drive local reform of services, evidence of the particular barriers to SLaM services experienced by women in care proceedings in the SLaM catchment area are needed.

### 8.5.2 Exploring a broader range of healthcare needs

This thesis suggests that, in addition to considerable mental health problems and substance misuse, women involved in care proceedings likely experience higher rates of physical health needs, indicated by higher rates of mortality compared to other women accessing SLaM services. This is supported by research from Wales that showed that women with children in proceedings had high rates of A&E attendances related to injury, accident, and assault compared to other mothers.[83]

Since 2018, I have been responsible for securing permissions from CAG, REC, NHS Digital, and Cafcass to establish a new linkage of HES data sets, including ONS mortality statistics, and Cafcass for all women with children in care proceedings between April 2007 and March 2019 (approx. 110,000 women). My colleagues and I received the last of these permissions in December 2020 and I have been working with NHS Digital and Cafcass to finalise data sharing agreements, with linkage expected by Spring 2022. This HES-Cafcass linked data set will be used in combination with data on all women giving birth in NHS hospitals in England between 1997 and 2019 (~97% births in England), approximately 12 million women. This will create a longitudinal resource with over 20 years of data on hospital admissions (1997-2020) and will enable the derivation of suitable control groups for women in proceedings to answer a number of key research. Having linked data for the whole of England will complement the data linkages in Wales between Cafcass Cymru and administrative healthcare data and will offer opportunity to perform cross-country comparisons.[82] The HES-Cafcass linkage will enable researchers to examine emergency healthcare use, physical conditions (including long-term conditions), live birth trajectories, and mortality (including cause of deaths) among women with children in proceedings. These data can be used to investigate local authority variation in healthcare need among women with children in proceedings to inform policy and practice at both the local and national level.

### 8.5.3 Extending linkages to other family members

This thesis is limited to mothers and does not explore health needs among fathers. However, the legal basis underpinning the CRIS-Cafcass data linkage could be applied to other individuals in care proceedings, including fathers. Recent work from Wales shows that fathers in care proceedings in Wales experience similarly high rates of mental health problems and substance

misuse, as well as high emergency hospital use, as women in proceedings. Replicating the Welsh research in other parts of the UK would help to develop a national picture of the healthcare needs fathers in proceedings experience to inform more widespread policy reform to ensure both birth mothers and birth fathers in care proceedings receive the support they need.

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# Appendix 0. Publications and outputs

**Publications during PhD period**

***PhD papers***

Bedston S*, Pearson R*, Jay MA, Broadhurst K, Gilbert R, Wijlaars L. Data Resource: Children and Family Court Advisory and Support Service (Cafcass) public family law administrative records in England. IJPDS, 2020; 5(1). Available from: http://dx.doi.org/10.23889/ijpds.v5i1.1159

Pearson RJ, Jay MA, Wijlaars LPMM, De Stavola B, Syed S, Bedston SJ, et al. Association between health indicators of maternal adversity and the rate of infant entry to local authority care in England: a longitudinal ecological study. BMJ Open, 2020; 10(8):e036564. Available from: http://dx.doi.org/10.1136/bmjopen-2019-036564

Pearson R, Jewell A, Wijlaars L, Bedston S, Finch E, Broadhurst K, et al. Linking data on women in public family law court proceedings concerning their children to mental health service records in South London. IJPDS, 2021; 6(1). Available from: http://dx.doi.org/10.23889/ijpds.v6i1.1385

Pearson RJ, Grant C, Wijlaars L, Finch E, Bedston S, Broadhurst K, et al. Mental health service use among mothers involved in public family law proceedings: linked data cohort study in South London 2007-2019 2021. Available from: http://dx.doi.org/10.31219/osf.io/htcdy.

***Other papers***

Pearson RJ, Jay MA, O'Donnell M, Wijlaars L, Gilbert R. Characterizing newborn and older infant entries into care in England between 2006 and 2014. Child Abuse & Neglect, 2020; 109:104760. Available from: http://dx.doi.org/10.1016/j.chiabu.2020.104760

Hossain M*, Pearson R*, McAlpine A, Bacchus L, Muuo SW, Muthuri SK, et al. Disability, violence, and mental health among Somali refugee women in a humanitarian setting. Glob Ment Health, 2020; 7. Available from: http://dx.doi.org/10.1017/gmh.2020.23

Hossain M*, Pearson RJ*, McAlpine A, Bacchus LJ, Spangaro J, Muthuri S, et al. Gender-based violence and its association with mental health among Somali women in a Kenyan refugee camp: a latent class analysis. J Epidemiol Community Health, 2020; 75(4):327–34. Available from: http://dx.doi.org/10.1136/jech-2020-214086

* Joint first authorship.

***Peer reviewer***[1]

**September 2020** International Journal of Population Data Science (IJPDS)

**February 2021** BMC Public Health

**June 2021** Nuffield Family Justice Observatory[2]

***Conferences and presentations***

**3-5th April 2019** Socio-Legal Studies Association annual conference. Oral Presentation entitled 'Exploring and explaining local authority variation in rates of care entry using longitudinal data from all children in care in England'.

**29th November 2019** UK Public Health Data Science. Poster presentation entitled 'Maternal adversity and variation in the rate of children entering local authority care during infancy in England: a longitudinal ecological study'. Abstract published in Lancet. https://doi.org/10.1016/S0140-6736(19)32873-9 Awarded NIHR runner up prize.

**9-11th December 2019** 4th International Conference on Administrative Data Research, Cardiff (UK). Oral presentation entitled 'Maternal adversity and variation in the rate of children entering local authority care during infancy in England: a longitudinal ecological study'.

**9th September 2020** UCL Institute of Mental Health international conference. Virtual poster presentation entitled 'Trajectories of mental health service use among women in care

[1] Verification of my journal peer-reviews are available from my Publons profile: https://publons.com/researcher/3568557/rachel-pearson/

[2] https://www.nuffieldfjo.org.uk/resource/health-vulnerabilities-parents-care-proceedings

proceedings in South London between 2009 and 2019'. Awarded the Institute of Mental Health poster prize.

**8-14th November 2020** International Population Data Linkage Network annual conference, Adelaide (Australia), held virtually. Live oral presentation entitled 'Novel linkage of administrative health and family court data to examine mental health need among women whose children enter care' and pre-recorded oral presentation entitled 'Using linked administrative health and family court data to evaluate maternal mental health -related risk factors for repeated child removals'.

***Stakeholder engagement***

**24th September 2019** I organised and held a focus group with two women and three practitioners from one of the Pause project's South London programmes. Pause provide a programme of support to women who have had children removed from their care via the family court and this programme currently operates in over 30 English local authorities.

**20th September 2020** I presented interim findings from the CRIS-Cafcass linkage to three members of the CRIS Data Linkage Service User Group in September 2020. This group consists of SLaM mental health service users with interests in data linkages using mental health records.

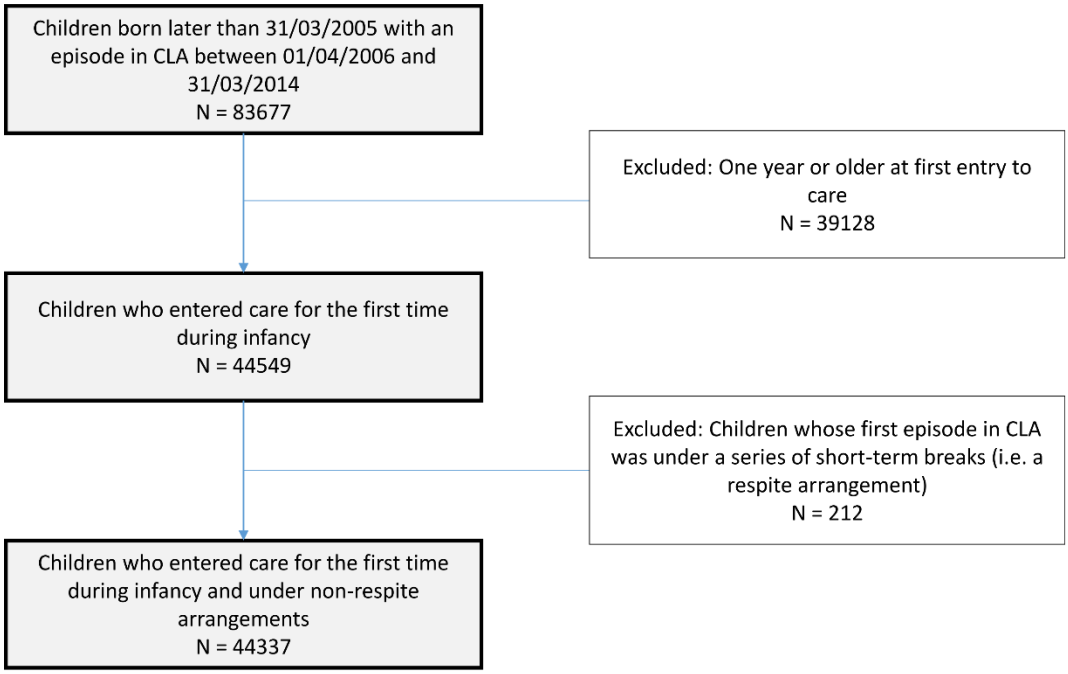
**11th December 2020** I presented interim findings from the CRIS-Cafcass linkage and future plans to the main project's Project Advisory Group. This group is comprised of Dr Mike Shaw (consultant child and adolescent psychiatrist and former co-director of the Family Drug and Alcohol Court National Unit ), Martha Cover (Barrister, child law specialist, and former head of Coram Chambers), Elana Covshoff (NHS programme manager for SHRINE, which delivers sexual and reproductive healthcare to marginalised people in South London), Amy Summerfield (Head of Engagement, Data First, Ministry of Justice), and Felicity Reed (Pause Southwark practice lead).

**25th May 2021** I presented aspects of the PhD project to 11 local authority leaders and practitioners in children's social care (Croydon, Lambeth, Lewisham, and Bexley) and practitioners from the South London and Maudsley NHS Foundation Trust involved in child safeguarding activities.

# Appendix 1. Chapter 1

# Appendix 2. Chapter 2

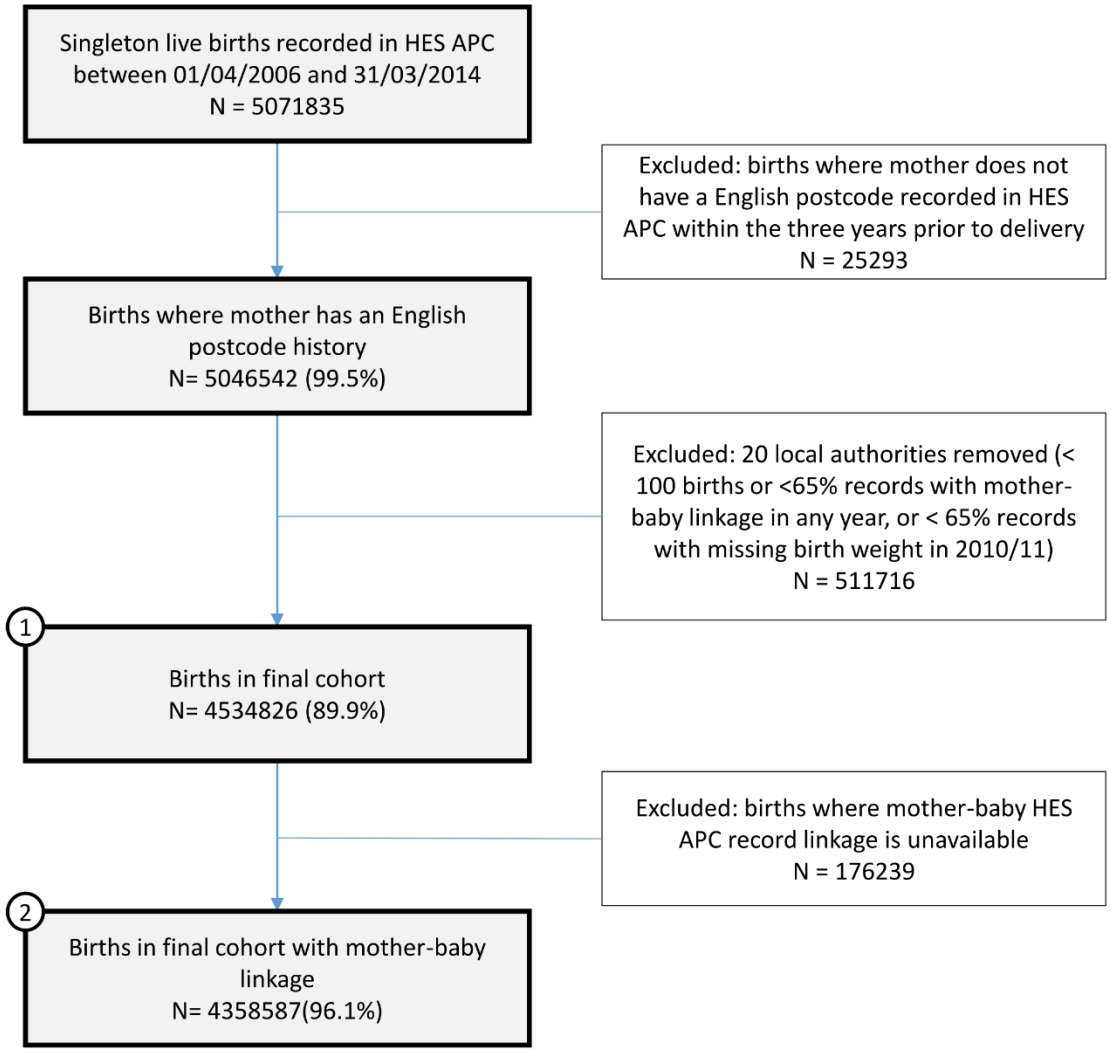
**Figure A 1.1: A flow diagram of the Children Looked After return (CLA) cohort selection**




**Missing data:**

Adhering to the Department for Education's statistical disclosure rules, I censored any counts less than 10 before outputting them from our secure data environment. Of the 1048 LA counts of infants entering care, 60 (5.7%) had to be censored before I could output them from UCL's secure data environment. I imputed these censored values with a randomly selected number from 0 to 9 before analysis (random seed set to 1234).

**Figure A 2.2: A flow diagram of the Hospital Episode Statistics Admitted Patient Care (HES APC) cohort selection**




**Missing data:**

Adhering to the Department for Health and Social Care's statistical disclosure rules, I censored any values derived from HES APC where the underlying counts were less than five before outputting them from our secure data environment. After outputting, I imputed censored counts with a randomly selected number from 0 to 4 (random seed set to 1234).

Note: I derived two cohorts using HES APC (please note that the extract of HES APC used only included individuals with dates of birth available).

**Table A 2.1: Censored values in study measures derived from HES APC**

| Explanatory measure | Number of values | Number of values less than five (%) |
|---|---|---|
| % of live births with maternal history of ARA | 1048 | 0 |
| % of live births where mother under 20 years old at delivery | 1048 | 0 |
| % of live births where maternal LSOA history within 10% most deprived LSOAs in England | 1048 | 24 (2.29%) |
| % of live births where child has a complex chronic condition | 1048 | 1 (0.10%) |
| % of live births with low birth weight | 1048 | 0 |

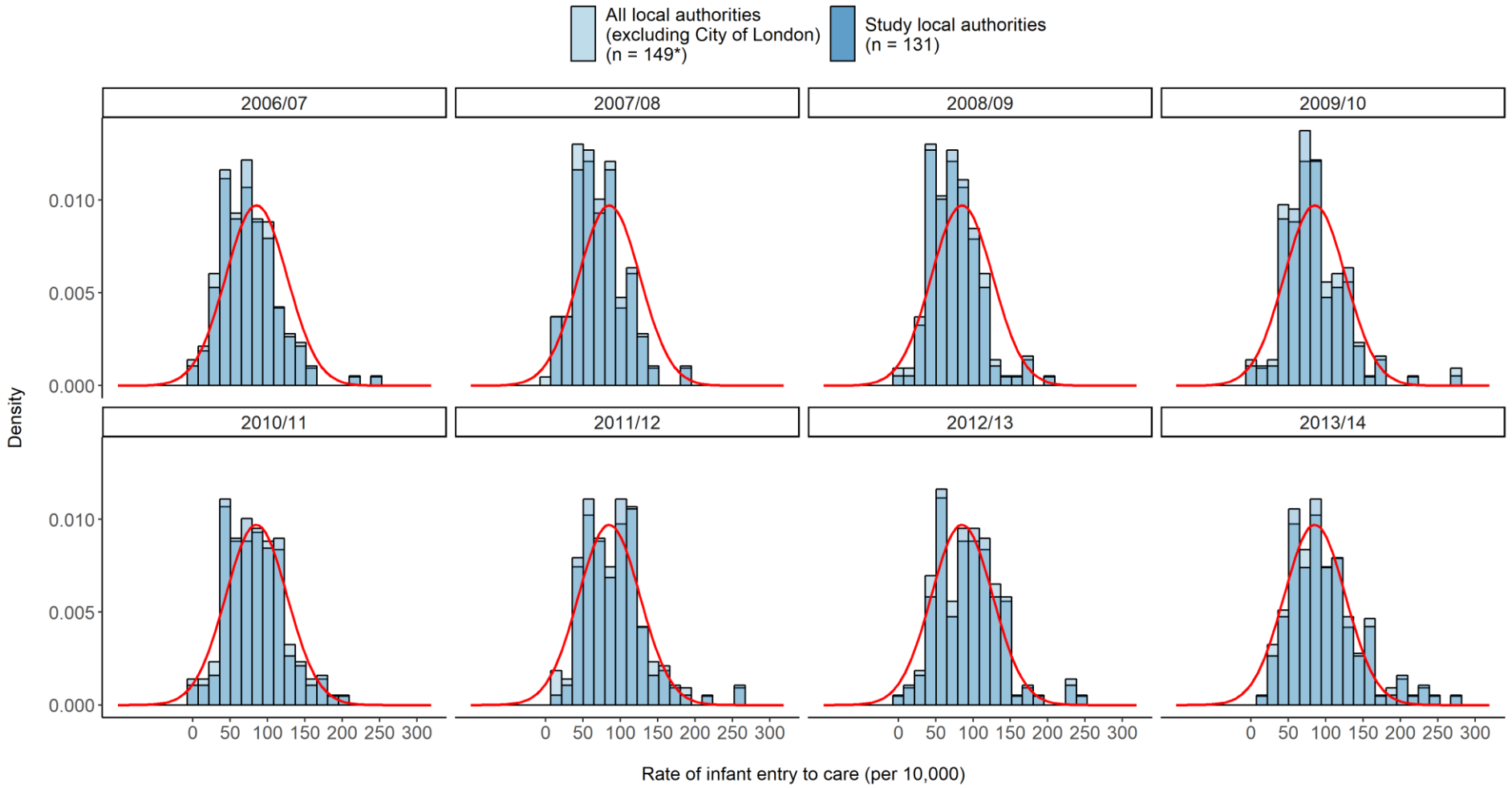
ARA = adversity-related hospital admission; LSOA = lower-layer super output area.

**Table A 2.2: ICD-10 code lists used to identify an adversity-related hospital admission in Hospital Episode Statistics Admitted Patient Care data**

| ICD-10 codes | Source |
|---|---|
| Mental Health disorders:<br>Behavioural and emotional disorder<br>F90-F95, F98<br><br>Neurotic, stress-related, and somatoform disorder<br>F40-F45, F48<br><br>Schizophrenia , Personality disorder, or Bipolar disorder<br>F20, F30-F33, F60-F62<br><br>Depressive episode or disorder<br>F32-F33<br><br>Substance use disorder<br>F10-F16, F18-F19<br><br>Other mental health disorder<br>F00-F09, F21-F25, F28, F34, F38-F39, F50-F55, F59, F63-F66, F68-F73, F79-F84, F88-F89, F99<br><br>Intentional self-harm<br>X60-X84<br><br>History of self-harm<br>Z91.5 (we also included Y87.0 – sequelae of intentional self-harm) | Nilsson, 2017<br><br>Herbert, 2015 |
| Substance misuse:<br>Alcohol misuse<br>E51.2, T51.0, X45.0-X45.2, X45.4, X45.6, X45.8, X45.9, X65.0-X65.2, X65.4, X65.5, X65.6, X65.8, X65.9, Y15.0, Y15.2, Y15.4, Y15.8, Y15.9, Y90.0-Y91.3, Y91.9, Z50.2, Z71.4, Z72.1 | Fone, 2016 |

| | |
|---|---|
| Alcohol and other substance misuse<br>E24.4, F10-F16, F18-F19, G31.2, G62.1, G72.1, I42.6, K29.2, K70.0-K70.9, K85.2, K86.0, O35.4, R78.0-R78.5, T36-T50 (we did not exclude T50.6, however), X40-X44, X46-X49, X69, Y10-Y14, Y16-Y19, Z04.0, Z50.3, Z71.5, Z72.2, T51 | Herbert, 2015 |
| <u>Exposure to violence:</u><br>Assault<br>X85-X99, Y01-Y05, Y08-Y09<br><br>Maltreatment<br>T73-T74, Y06-Y07<br><br>Injury: undetermined cause<br>Y20-Y34, Z04.5 (we excluded Z04.8) | Herbert, 2015 |

**Figure A 2.3: The distribution of local authority rates of infant entry to care over the study period**




* There were 151 local authorities in 2006/07; however, the Isles of Scilly did not have any children in their care over the study period.
Data source: Children Looked After return, Department for Education.

**Table A 2.3: Linear mixed-effect modelling results (models 1-4)**

| Model parameter | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Type of model parameter |
|---|---|---|---|---|---|---|---|---|---|
| | Estimate | 95% C.I. | Estimate | 95% C.I. | Estimate | 95% C.I. | Estimate | 95% C.I. | |
| Time (e.g.,financial year Apr-March) | 3.99 | 3.15 to 4.84 | 2.46 | 1.29 to 3.64 | 2.53 | 1.35 to 3.71 | 2.39 | 1.25 to 3.53 | fixed-effect |
| % of live births with maternal history of ARA | | | (within-LA) 2.44<br>(between-LA) 11.63 | 1.10 to 3.78<br>8.94 to 14.31 | 2.33<br>3.89 | 0.98 to 3.68<br>0.79 to 6.98 | (overall) 2.56 | 1.31 to 3.82 | fixed-effect |
| % of live births where mother < 20 years old | | | | | 6.77 | 4.50 to 9.03 | 7.25 | 5.22 to 9.28 | fixed-effect |
| % of live births where maternal postcode history within 10% most deprived LSOAs in England | | | | | 0.01 | -0.35 to 0.37 | 0.04 | -0.31 to 0.39 | fixed-effect |
| % of live births where child has a complex chronic condition | | | | | 13.42 | 4.55 to 22.30 | 14.22 | 5.51 to 22.93 | fixed-effect |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| % of live births with low birth weight | | | 1.28 | -2.93 to 5.48 | 1.00 | -3.16 to 5.17 | fixed-effect |
| LA population size (000s) | | | -0.08 | -0.14 to -0.02 | -0.08 | -0.14 to -0.02 | fixed-effect |
| % of dependent child households with lone parent | | | 1.87 | 0.65 to 3.09 | 1.96 | 0.76 to 3.17 | fixed-effect |
| Rate of violent crime (per 100 LA residents) | | | 6.10 | -3.12 to 15.32 | 5.05 | -3.88 to 13.98 | fixed-effect |
| LA – random intercept (sd) | 29.25 | 24.50 | 20.56 | | 20.58 | | random-effect |
| Time (financial year) – random slope (sd) | 3.91 | 3.78 | 3.78 | | 3.78 | | random-effect |
| Correlation between random intercept and random slope | 0.14 | -0.11 | -0.45 | | -0.45 | | random-effect |
| Residual error | 19.43 | 19.37 | 19.37 | | 19.37 | | residual |

**ARA** = adversity-related hospital admission; **LA** = local authority; **LSOA** = lower-layer super output area; **sd** = standard deviation.

**Table A 2.4: Linear mixed-effect modelling results (model 5)**

| Model parameter | Estimate | 95% C.I. | Type of model parameter |
|---|---|---|---|
| Time (financial year) (where average maternal ARA = 0) | 0.78 | -0.54 to 2.10 | fixed-effect |
| % of live births with maternal history of ARA (in 2006/07) | 0.16 | -1.93 to 2.25 | fixed-effect |
| Effect of unit increase in time on average % of live births with maternal history of ARA (or vice versa) | 0.44 | 0.15 to 0.72 | fixed-effect |
| % of live births where mother < 20 years old | 8.29 | 6.23 to 10.35 | fixed-effect |
| % of live births where maternal postcode history within 10% most deprived LSOAs in England | 0.06 | -0.30 to 0.41 | fixed-effect |
| % of live births where child has a complex chronic condition | 14.19 | 5.37 to 23.01 | fixed-effect |
| % of live births with low birth weight | 0.60 | -3.62 to 4.82 | fixed-effect |
| LA population size (000s) | -0.08 | -0.15 to -0.02 | fixed-effect |
| % of dependent child households with lone parent | 1.92 | 0.70 to 3.14 | fixed-effect |
| Rate of violent crime (per 100 LA residents) | 5.20 | -3.86 to 14.25 | fixed-effect |
| Local Authority – random intercept (sd) | 18.55 | | random-effect |
| Residual error | 21.35 | | residual |

**ARA** = adversity-related hospital admission; **LA** = local authority; **LSOA** = lower-layer super output area; **sd =** standard deviation.

**Table A 2.5: Conditional coefficient estimates for percentage of live births with maternal history of adversity-related hospital admissions, by financial year (model 5)**

| Measure | Financial year | Conditional coefficient estimate | 95% C.I. |
|---|---|---|---|
| Effect of a 1% point increase in % of live births with maternal history of ARA in… | 2006/07 | 0.13 | -2.01 to 2.28 |
| | 2007/08 | 0.57 | -1.32 to 2.48 |
| | 2008/09 | 1.01 | -0.65 to 2.69 |
| | 2009/10 | 1.45 | -0.03 to 2.93 |
| | 2010/11 | 1.89 | 0.59 to 3.21 |
| | 2011/12 | 2.33 | 1.13 to 3.53 |
| | 2012/13 | 2.77 | 1.61 to 3.93 |
| | 2013/14 | 3.21 | 2.03 to 4.39 |

**ARA** = adversity-related hospital admission.

**Note:** Created using R package 'interplot' https://cran.r-project.org/web/packages/interplot/index.html.

# Appendix 3. Chapter 3

**Search terms**

- "risk#factor*" OR "correlates" OR predictor* OR predict OR association OR associated
- parent* OR mother* OR maternal* OR father* OR paternal*
- "public care" OR "out#of#home care" OR "court proceeding*" OR "care proceeding*" OR "children* service*" OR "child* protection" OR "child* social care" OR "child* social service*" OR "child* welfare"
- link* OR match* OR deterministic* OR probabilistic* OR "rules-based"

# Appendix 4. Chapter 4

**Legal basis for sharing and processing Cafcass person identifiers for linkage**

Cafcass was established under Chapter 2 of the Criminal Justice and Court Services Act 2000, with the legal basis for Cafcass data collection and sharing Cafcass data for research provided by section 13(5) of the act. This states that: *"The Service [Cafcass] may commission, or assist the conduct of, research by any person into matters concerned with the exercise of its functions."*

Furthermore, the legal basis for processing Cafcass data for linkage to other data is provided by the Family Procedure Rules: Practice Direction 12G (2.1) Communication of information by a party etc. for other purposes.[3] Specifically, it states that "*A party, any person lawfully in receipt of information or a proper officer [may communicate to] a person or body conducting an approved research project any information relating to the proceedings for the purpose of an approved research project".*

Cafcass further interprets Practice Direction 12G (2.1) in its privacy notice for service users, stating that "*[Cafcass] data may also be linked to other information that is held about you by third parties.*" for approved research.[4]

To ensure the processing of personal data, such as example linking two data sets together, is lawful, researchers also need to identify a legal basis under Article 6 of the UK General Data Protection Regulations (GDPR), introduced in 2018.[5] This linkage relied upon Article 6(e), 'public task' which enables processing of personal data to perform a specific task in the public interest, with a basis in law. Researchers also need to identify a legal basis under Article 9 to process special category data (which includes data concerning health and ethnicity) without explicit consent of the data subject. This linkage relied upon Article 9(2)(j) 'Archiving, research and statistics (with a basis in law)'. Under UK law, processing that relies on 9(2)(j) must also meet Part 1(4) of Schedule 1 of the Data Protection Act (DPA) 2018, which outlines that processing must be a necessary, reasonable, and proportionate way of achieving the purpose for processing (here the purpose is research).[6] The processing must also meet the safeguards

[3] https://www.justice.gov.uk/courts/procedure-rules/family/practice_directions/pd_part_12g
[4] https://www.cafcass.gov.uk/about-cafcass/policies/privacy-data-protection/privacy-notice-service-users/
[5] https://ico.org.uk/for-organisations/guide-to-data-protection/guide-to-the-general-data-protection-regulation-gdpr/lawful-basis-for-processing/
[6] https://ico.org.uk/for-organisations/guide-to-data-protection/guide-to-the-general-data-protection-regulation-gdpr/special-category-data/what-are-the-conditions-for-processing/

and restrictions outlined in Article 89(1) of the UK GDPR and section 19 of the DPA 2018. Finally, it should be demonstrated that the processing is in the public interest.

**Table A 4.1: Dates of South London and Maudsley substance misuse service provision to local authorities in London over the study period**

| Local authority (London) | Service provision between April 2007 and March 2019 |
|---|---|
| Bexley | Apr 2007 to Mar 2019 |
| Bromley | none |
| Croydon | Apr 2007 to Aug 2014 |
| Greenwich | Apr 2007 to Mar 2019 |
| Lambeth | Apr 2007 to Mar 2019 |
| Lewisham | Apr 2007 to Dec 2010 |
| Southwark | Apr 2007 to Dec 2015 |
| Wandsworth | Aug 2015 to Mar 2019 |

**Cafcass data cleaning**

- Cafcass data pre-processing included checking and validating gender, forenames and postcode. Person name fields were cleaned to remove any information which was not a name (e.g.,Mr, Mrs, job title or role in the case) and only name was allowed, though hyphenated names were ok.
- Gender was validated against twenty years of the forenames of baby boys and girls provided by the ONS.[7] Where at least 99% of children born with a particular forename were of the same gender, that gender was compared against gender recorded in Cafcass,

[7] Office for National Statistics. (2017). Baby names in England and Wales Statistical bulletins - Office for National Statistics.

raising a flag for manual review if found to be different. This approach was also used to infer gender for those with missing gender in Cafcass.

- Where the postcode field was empty, the other address fields were searched using a regular expression to extract postcode for the address field. All postcodes were then cleaned and validated against the UK format.
- De-duplication of the individuals was performed. This involved blocking individuals according to the Soundex code for their gender and forename. Comparisons were made between all individuals within blocks based on the Jaro-Winkler distances between forename, surname, and date of birth.[8] Match probabilities were calculated using an implementation of EpiLink in the R package 'RecordLinkage'.[9]

**Further manual review of CRIS-Cafcass links**

After removing false matches and performing de-duplication, I undertook further manual review of de-identified clinical notes and correspondence text for a random sample of 100 BRCIDS that linked at any step of the linkage algorithm to look for positive mentions of care proceedings. First, I searched for mentions of key words related to care proceedings (such as 'family court', 'child protection' and 'proceedings') and checked any positive mentions to ensure they directly related to the patient and fitted into the timeline of proceedings for the linked Cafcass person ID. Second, for women with no positive mentions of these key words, I reviewed de-identified clinical case notes and correspondence in CRIS closest to dates of their care proceedings recorded in Cafcass.

My search returned positive mentions of care proceedings for 95 women, however, for 5 women there was too little information to confirm or contradict their linkage status.

[8] Winkler, W. (1990). String Comparator Metrics and Enhanced Decision Rules in the Fellegi-Sunter Model of Record Linkage. In Proceedings of the Section on Survey Research Methods.
[9] https://cran.r-project.org/web/packages/RecordLinkage/RecordLinkage.pdf

**Table A 4.2: Number of match-pairs and number of match-pairs excluded, by steps 1 to 8 of the linkage algorithm**

| Step | Number of Cafcass Person IDs that linked to a BRCID | Number of match-pairs excluded* |
|---|---|---|
| 1 | 1456 | |
| 2 | 143 | |
| 3 | 49 | |
| 4 | 67 | |
| 5 | 304 | |
| 6 | 1010 | |
| 7 | 148 | |
| 8 | 39 | 4 |
| Total** | 2843 | 4 |
| Total after exclusions† | 2840 | |

* Only match-pairs from step 8 of the linkage algorithm were reviewed to identify false matches.

** Row totals will not add up to the total as one Cafcass person ID may match to two or more BRCIDs across the different matching steps.

† Two of the match-pairs excluded had the same Cafcass person ID

**Figure A 4.1: The percentage of Cafcass person IDs who linked to a SLaM service user record, before de-duplication but excluding false matches, (n = 2840) who were missing date of birth or had no recorded postcode in the Cafcass data**

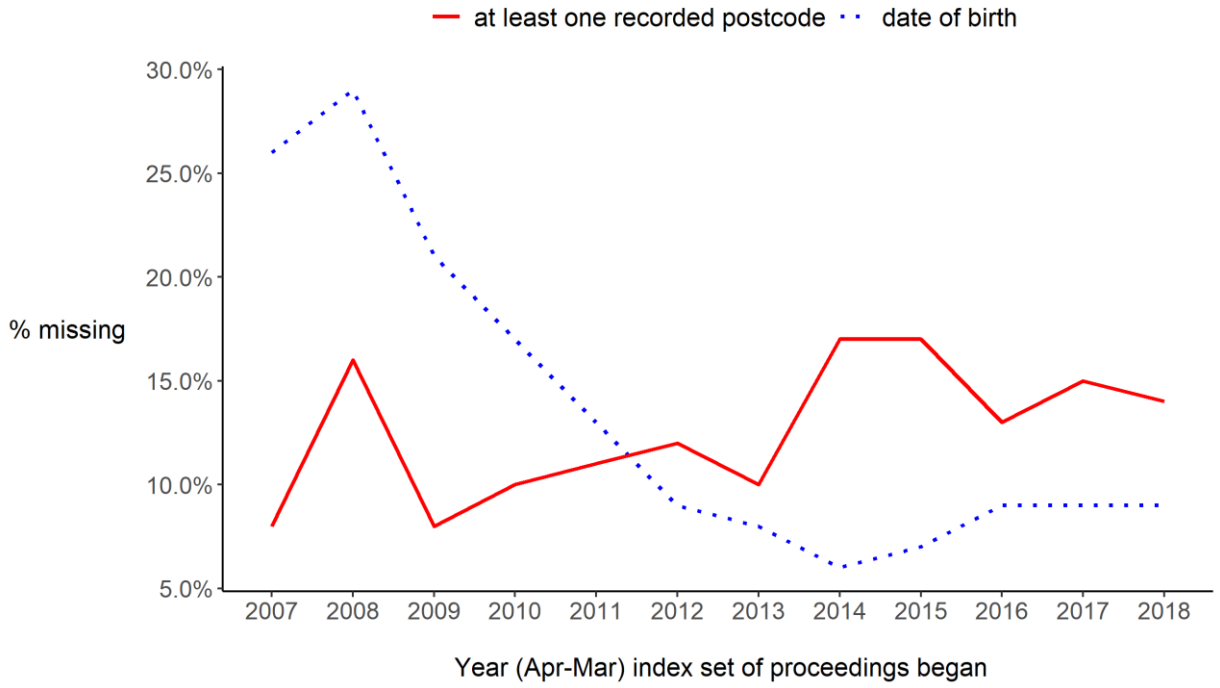


**Table A 4.3: Missingness among person identifiers in the CRIS database, by electronic patient record system**

**ePJS total service user records as at 8th July 2020: 356,814**

| | Count (%) | | | | |
|---|---|---|---|---|---|
| | Forename | Surname | Sex | DOB | Postcode (at least one) |
| Not missing: | 356,814 (100.00) | 356,814 (100.00) | 356,563 (99.93) | 356,095 (99.80) | 347,752 (97.46) |
| Missing: | 0 (0.00) | 0 (0.00) | 251 (0.07) | 719 (0.20) | 9062 (2.54) |

**Iaptus total service user records as at 8th July 2020: 217,570**

| | Count (%) | | | | |
|---|---|---|---|---|---|
| | Forename | Surname | Sex | DOB | Postcode (at least one) |
| Not missing: | 217,570 (100.00) | 217,569 (100.00) | 216,905 (99.69) | 217,546 (99.99) | 216,891 (99.69) |
| Missing: | 0 (0.00) | 1 (0.00) | 665 (0.31) | 24 (0.01) | 679 (0.31) |

**Table A 4.4: Missingness in key person identifiers in the Cafcass data among the study cohort (n = 3226)**

| | | Missingness in Cafcass identifiers (%) | |
|---|---|---|---|
| Local authority of care proceedings | Number of women | Date of birth only | Date of birth AND no valid postcode |
| Croydon | 807 | 62 (7.7) | 30 (3.7) |
| Lambeth | 773 | 40 (5.2) | 29 (3.8) |
| Lewisham | 869 | 82 (9.4) | 28 (3.2) |
| Southwark | 844 | 54 (6.4) | 28 (3.3) |
| Overall | 3226 | 237 (7.3) | 115 (3.6) |

**Table A 4.5: Modelling sociodemographic and case characteristics against match status among women involved in proceedings in Croydon, Lambeth, Lewisham and Southwark between April 2007 and March 2019: odds ratios with 95% confidence intervals (n = 3226)**

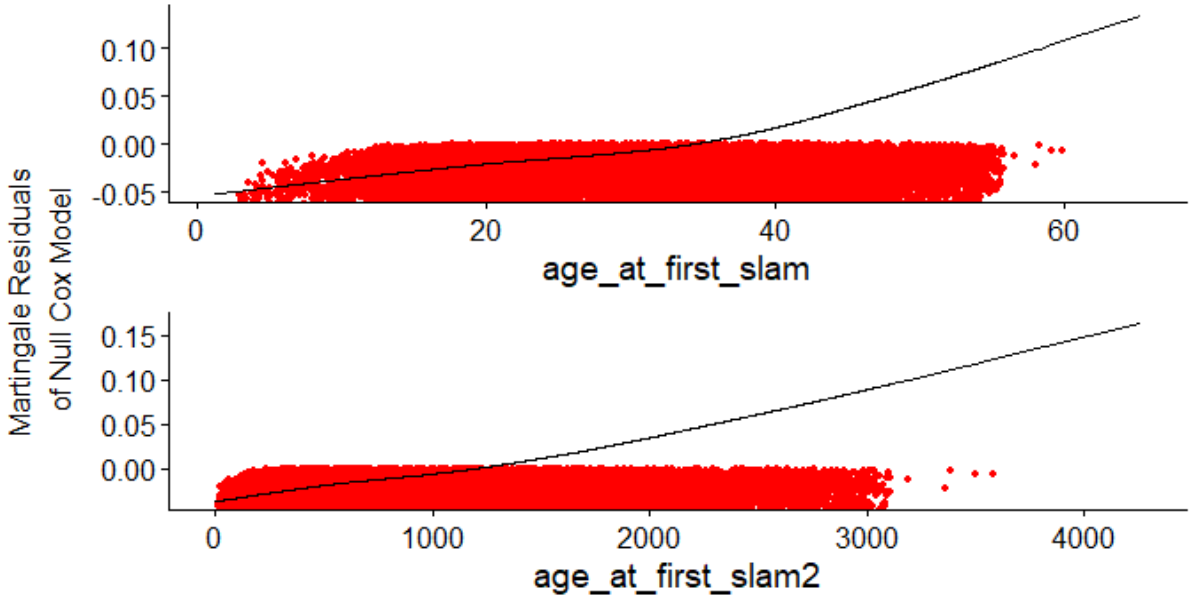
| Variable | Odds Ratio | 95% Confidence Interval |
|---|---|---|
| **Age at index set of care proceedings** | | |
| Under 25 years old (ref) | | |
| 25-34 years old | 0.82 | 0.65 to 1.04 |
| 35 years old and over | 0.69 | 0.54 to 0.88 |
| Age unknown | 0.08 | 0.06 to 0.11 |
| **Ethnicity** | | |
| White or White British (ref) | | |
| Black or Black British | 0.65 | 0.50 to 0.83 |
| Other | 0.59 | 0.43 to 0.81 |
| Ethnicity unknown | 0.73 | 0.59 to 0.91 |
| **Number of sets of care proceedings recorded in Cafcass** | | |
| One (ref) | | |
| Two or more | 1.23 | 1.00 to 1.51 |
| **Year (April-March) that index set of care proceedings began** | 1.00 | 0.97 to 1.02 |
| **IMD 2010 quintile associated with address at index set of proceedings** | | |
| 1 – most deprived (ref) | | |
| 2 | 1.00 | 0.82 to 1.22 |
| 3 | 0.73 | 0.56 to 0.96 |
| 4 or 5 – least deprived | 0.51 | 0.34 to 0.78 |
| Address unknown | 0.43 | 0.34 to 0.55 |
| **Had an infant child subject to proceedings** | 1.42 | 1.18 to 1.71 |
| **Had at least one child placed into out-of-home care, with extended family, or for adoption (i.e., having PR curtailed or terminated)** | 1.44 | 1.20 to 1.73 |

**Table A 4.6: Modelling sociodemographic and case characteristics against match status among women involved in proceedings in Croydon, Lambeth, Lewisham and Southwark between April 2010 and March 2019: odds ratios with 95% confidence intervals (n = 2380)**

| Variable | Odds Ratio | 95% Confidence Interval |
|---|---|---|
| **Age at index set of care proceedings** | | |
| Under 25 years old (ref) | | |
| 25-34 years old | 0.64 | 0.48 to 0.85 |
| 35 years old and over | 0.52 | 0.39 to 0.70 |
| Age unknown | 0.06 | 0.04 to 0.08 |
| **Ethnicity** | | |
| White or White British (ref) | | |
| Black or Black British | 0.59 | 0.44 to 0.80 |
| Other | 0.51 | 0.36 to 0.75 |
| Ethnicity unknown | 0.63 | 0.47 to 0.83 |
| **Number of sets of care proceedings recorded in Cafcass** | | |
| One (ref) | | |
| Two or more | 1.28 | 0.99 to 1.65 |
| **Year (April-March) that index set of care proceedings began** | 0.98 | 0.93 to 1.03 |
| **IMD 2010 quintile associated with address at index set of proceedings** | | |
| 1 – most deprived (ref) | | |
| 2 | 0.93 | 0.74 to 1.17 |
| 3 | 0.68 | 0.49 to 0.93 |
| 4 or 5 – least deprived | 0.46 | 0.28 to 0.74 |
| Address unknown | 0.40 | 0.3 to 0.53 |
| **Had an infant child subject to proceedings** | 1.25 | 1.00 to 1.56 |
| **Had at least one child placed into out-of-home care, with extended family, or for adoption (i.e., having PR curtailed or terminated)** | 1.39 | 1.13 to 1.71 |

# Appendix 5. Chapter 5

**Figure A 4.1: Checking for non-linear effect of age at first SLaM contact on mortality up to 31stMarch 2020 among women in the care proceedings cohort (n = 2137) and the matched controls (n = 17,096)**




Likelihood ratio tests between the model with age as a quadratic effect and age as a linear effect and between the model with age modelled using a natural cubic spline and age as a linear effect yielded no evidence of a non-linear relationship between death over follow-up and age at first SLaM contact.

**Figure A 5.3: dfbeta values plot for model covariates (age at first SLaM contact – left) ; membership of the care proceedings cohort – right) in the cox model investigating mortality**

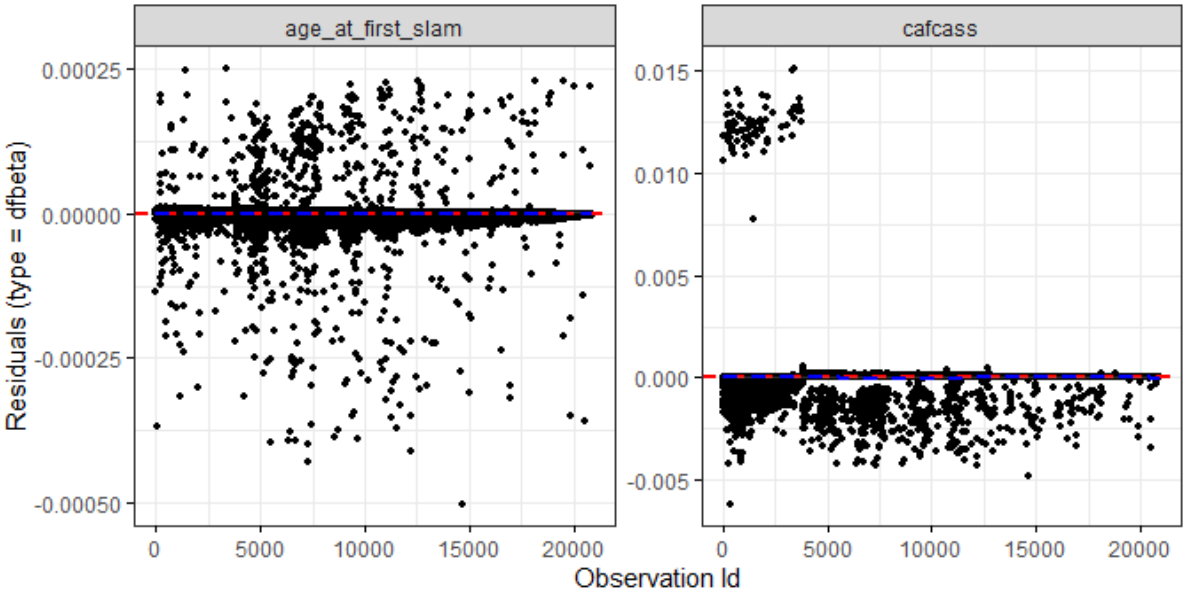



**Figure A 5.2: Schoenfeld residuals plot for model covariates (membership of the care proceedings cohort – top; age at first SLaM contact – bottom) in the cox model investigating mortality**

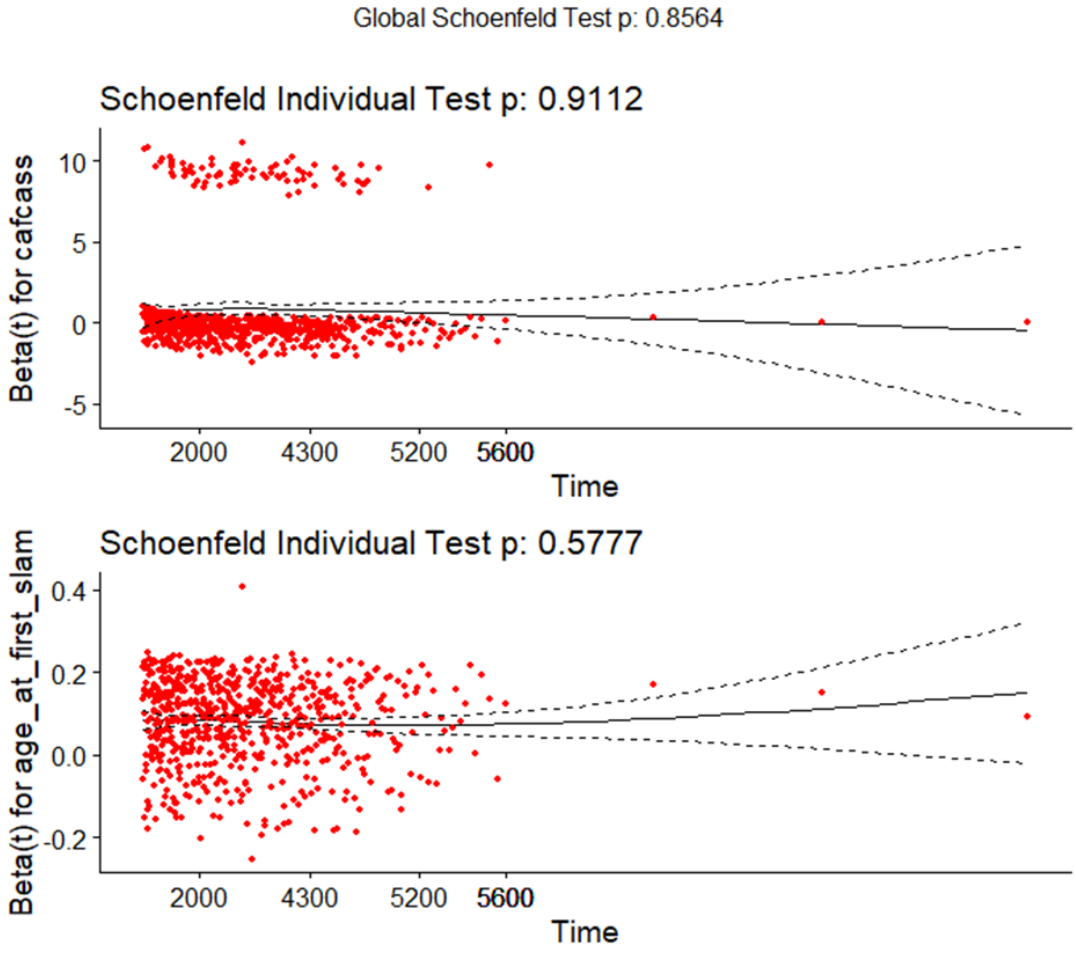
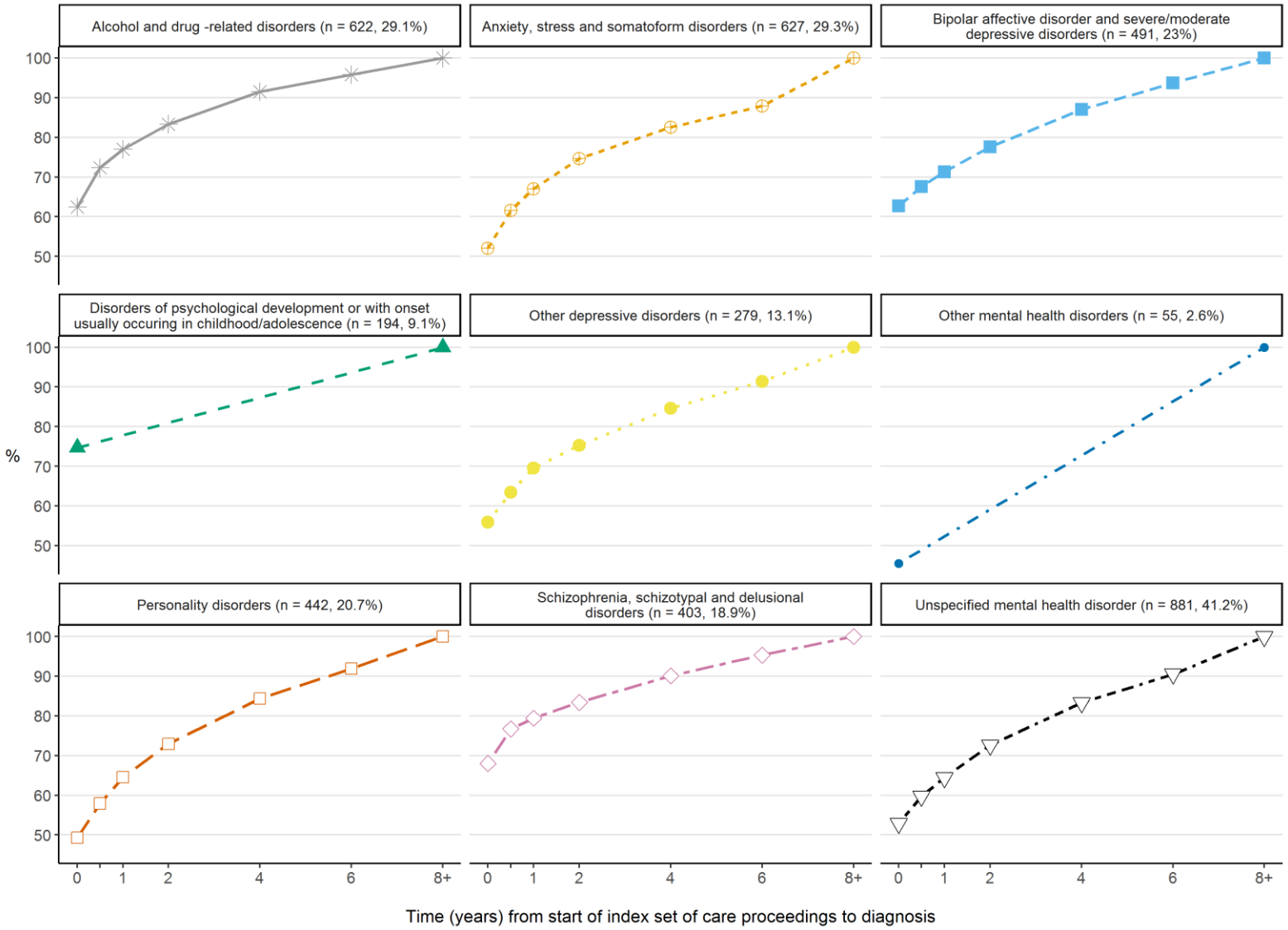
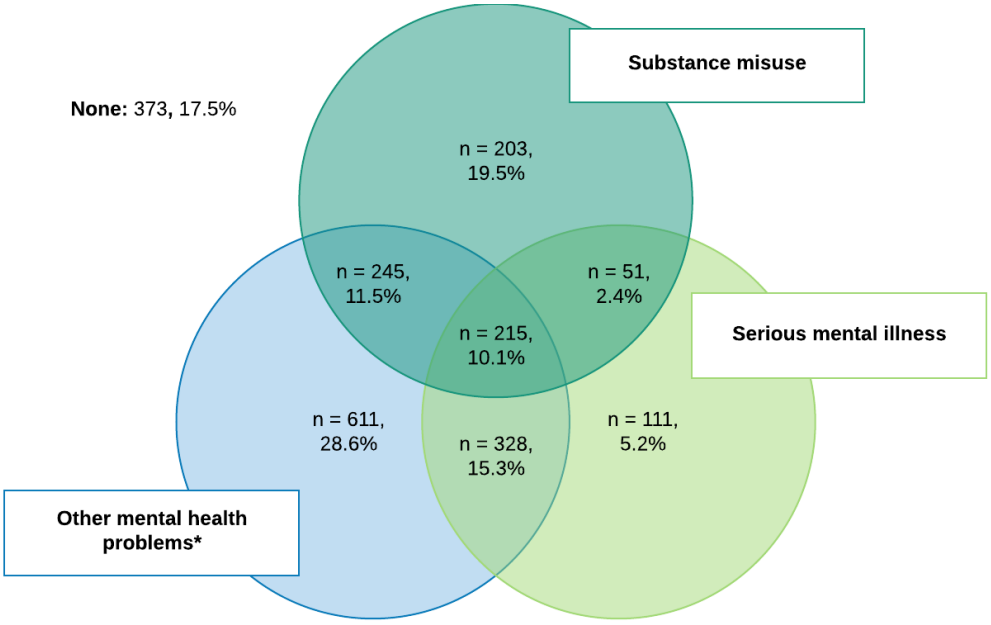


**Figure A 5.4: Timing of diagnoses relative to women's index set of care proceedings (n = 1747), by diagnosis**




**Note:** Only the proportion of diagnoses made by time = 0 and time = 8+ were show for the 'Other mental health disorders' and 'Disorders of psychological development or with onset usually occurring in childhood/adolescence' categories due to small cell counts (< 10).

**Figure A 5.5: Multiple diagnoses among women involved in care proceedings and known to SLaM services (n = 2137)**




• Includes anxiety disorders, other depressive disorders, personality disorders, disorders od psychological development or with onset usually occuring in childhood/adolescence, unspecified mental health disorders and diagnoses in the 'Other mental health disorders' category.

**Table A 5.1: Cox proportional hazards model results**

| Covariate | Time-varying covariate? | Hazard Ratio (95% confidence Interval) | Standard error | P-value |
|---|---|---|---|---|
| Involvement in care proceedings (0 = no, 1 = yes) | Yes | 2.15 (1.68 to 2.74) | 0.12 | < 0.001 |
| Age at first SLaM contact (years) | - | 1.08 (1.08 to 1.09) | 0.004 | < 0.001 |
| Involvement in care proceedings (0 = no, 1 = yes) | No | 1.66 (1.30 to 2.12) | 0.12 | < 0.001 |
| Age at first SLaM contact (years) | - | 1.08 (1.07 to 2.09) | 0.004 | < 0.001 |

Note: 3 of the matched controls had a death date preceding their first contact with SLaM and were excluded from this analysis (0.5% of matched controls who died and 0.02% of all matched controls). The top two rows show the final model, and the bottom two rows show the sensitivity analysis model (i.e., without 'Involvement in care proceedings' as a time-dependent covariate).

**Table A 5.2: Substance-related psychiatric diagnoses, by cohort**

| | Frequency (%) or Median [25%, 75% quantile] among women using SLaM services | |
|---|---|---|
| **Substance-related psychiatric diagnoses** | Cases (n = 2137) | Matched controls (n = 17,096) |
| Drug-related diagnoses | 464 (21.7) | 998 ( 5.8) |
| Alcohol-related diagnoses | 290 (13.6) | 978 ( 5.7) |

**Table A 5.3: Distribution of the matching variable, by cohort**

| | Frequency (%) or Median [25%, 75% quantile] among women using SLaM services | |
|---|---|---|
| **Matching variables** | Cases (n = 2137) | Matched controls (n = 17,096) |
| **Electronic patient record system** | | |
| ePJS record only | 922 (43.1) | 7376 (43.1) |
| Iaptus record only | 189 ( 8.8) | 1512 ( 8.8) |
| Both | 1026 (48.0) | 8208 (48.0) |
| | | |
| **Follow-up time** | | |
| Time from first SLaM contact to end of study (31st March 2020) or death | 10.63 [7.01, 13.19] | 10.59 [6.99, 13.16] |

**Table A 5.4: Age and ethnicity, by cohort**

| | Frequency (%)* or Median [25%, 75% quantile] among women using SLaM services | |
|---|---|---|
| | Cases (n = 2137) | Matched controls (n = 17,096) |
| **Age at first SLaM contact** | | |
| 0-17 years | 288 (13.5) | 2218 (13.0) |
| 18-24 | 425 (19.9) | 2906 (17.0) |
| 25-29 | 431 (20.2) | 2594 (15.2) |
| 30-34 | 364 (17.0) | 2399 (14.0) |
| 35-39 | 299 (14.0) | 2217 (13.0) |
| 40-44 | 193 ( 9.0) | 1921 (11.2) |
| 45-49 | 94 ( 4.4) | 1633 ( 9.6) |
| 50+ | 43 ( 2.0) | 1208 ( 7.1) |
| | | |
| **Ethnicity** | | |
| White | 1044 (48.9) | 9061 (53.0) |
| Black or Black British | 701 (32.8) | 3823 (22.4) |
| Asian or Asian British | 44 ( 2.1) | 428 ( 2.5) |
| Mixed heritage | 149 ( 7.0) | 768 ( 4.5) |
| Other | 143 ( 6.7) | 1784 (10.4) |

* Percentages presented for the matched controls are age standardised.

**Table A 5.5: Estimated 5 and 10-year mortality rates for women aged 21, 28, and 36 years old at first SLaM contact**

| Time since first SLaM contact (years) | Age at first SLaM contact | Estimated mortality rate | |
|---|---|---|---|
| | | Cases | Matched controls |
| 5 | 21 years | 0.73% (0.56 to 0.97) | 0.34% (0.28 to 0.42) |
| 5 | 28 years | 1.29% (0.99 to 1.66) | 0.60% (0.51 to 0.71) |
| 5 | 36 years | 2.43% (1.90 to 3.12) | 1.14% (0.99 to 1.31) |
| 10 | 21 years | 1.79% (1.39 to 2.30) | 0.84% (0.70 to 1.01) |
| 10 | 28 years | 3.12% (2.47 to 3.94) | 1.46% (1.27 to 1.68) |
| 10 | 36 years | 5.85% (4.67 to 7.32) | 2.77% (2.50 to 3.07) |

* the ages 21, 28 and 36 are the 25%, 50% (median) and 75% quantiles of age at first SLaM contact among the care proceedings cohort.

Note: 3 of the matched controls had a death date preceding their first contact with SLaM and were excluded from this analysis (0.5% of matched controls who died and 0.02% of all matched controls).

# Appendix 6. Chapter 6

**Table A 6.1: Comparing age and ethnicity between the Chapter 5 and Chapter 6 study cohorts.**

| Characteristic | Frequency (%) or Median [25%, 75% quantile] | |
|---|---|---|
| | Chapter 6 study cohort (n = 1709) | Chapter 5 study cohort (n = 2137) |
| Age at first SLaM contact | 27.60 [20.23, 35.29] | 28.20 [21.01, 35.64] |
| Ethnicity (%) | | |
| White | 811 (47.5) | 1044 (48.9) |
| Black or Black British | 573 (33.5) | 701 (32.8) |
| Asian or Asian British | more than 34 | 44 ( 2.1) |
| Mixed | 122 ( 7.1) | 149 ( 7.0) |
| Other | 119 ( 7.0) | 143 ( 6.7) |
| Unknown | censored | 56 ( 2.6) |

Note: where the difference between counts in the Chapter 6 study cohort and the Chapter 5 study cohort are less than 10, the Chapter 6 study cohort count will be shown as 'more than X' where X is the Chapter 5 study cohort count minus 10.;

Counts have been censored where their disclosure would enable the reader to work out supressed counts.

Variable definitions are available in Chapter 5, Section 5.3.4 Measures.

SLaM = South London and Maudsley NHS Foundation Trust.

**Table A 6.2: GRoLTs Checklist**

| | |
|---|---|
| **1. Is the metric of time used in the statistical model reported?** | Yes |
| **2. Is information presented about the mean and variance of time within a wave?** | No - all subjects are followed up in the data for the same amount of time. |
| **3a. Is the missing data mechanism reported?** | N/A - see point 2. |
| **3b. Is a description provided of what variables are related to attrition/missing data?** | N/A - see point 2. |
| **3c. Is a description provided of how missing data in the analyses were dealt with?** | N/A - see point 2. |
| **4. Is information about the distribution of the observed variables included?** | Yes - Figure A 6.1 |
| **5. Is the software mentioned?** | Yes |
| **6a. Are alternative specifications of within-class heterogeneity considered (e.g., LGCA vs. LGMM) and clearly documented? If not, was sufficient justification provided as to eliminate certain specifications from consideration?** | Yes |

| | |
|---|---|
| **6b. Are alternative specifications of the between-class differences in variance–covariance matrix structure considered and clearly documented? If not, was sufficient justification provided as to eliminate certain specifications from consideration?** | Yes. I allowed the variance/covariance matrix of the random effects to vary by class. I could not get any model with this specification to converge, likely due to the small sample size. |
| **7. Are alternative shape/functional forms of the trajectories described?** | Yes |
| **8. If covariates have been used, can analyses still be replicated?** | N/A - no covariates included |
| **9. Is information reported about the number of random start values and final iterations included?** | Yes |
| **10. Are the model comparison (and selection) tools described from a statistical perspective?** | Yes |
| **11. Are the total number of fitted models reported, including a one-class solution?** | Yes |
| **12. Are the number of cases per class reported for each model (absolute sample size, or proportion)?** | Yes |
| **13. If classification of cases in a trajectory is the goal, is entropy reported?** | Yes - |
| **14a. Is a plot included with the estimated mean trajectories of the final solution?** | Yes - Figure 6.5Table A 6.4 |
| **14b. Are plots included with the estimated mean trajectories for each model?** | Yes - Figure A 6.5 |

| | |
|---|---|
| **14c. Is a plot included of the combination of estimated means of the final model and the observed individual trajectories split out for each latent class?** | No, I cannot present individual-level data as per the data controller's statistical disclosure rules |
| **15. Are characteristics of the final class solution numerically described (i.e., means, SD/SE, n, CI, etc.)?** | No - graphically only |
| **16. Are the syntax files available (either in the appendix, supplementary materials, or from the authors)?** | Yes - https://github.com/RachelPearson/PhD-analyses/blob/main/Chapter%206/analysis_script.r |

**Modelling steps**

1. compare link functions for a 1-class LCMM, compare AIC/BIC and graphical display of residuals & link functions
2. using chosen link function, run LCMMs with 1-7 classes and compare with AIC/BIC, class size, OCCs, avePPs and entropy.
3. For LCMMs with 1-7 classes, run 3 further models: 1) allow random effects (i.e., intercept and time) to be correlated, 2) allow random effects to be correlated and allow the variance-covariance matrix for the random effects to vary by class, and 3) only allow the variance-covariance matrix for the random effects to vary by class (but not for random effects to be correlated). Compare using AIC/BIC, class size, OCCs, avePPs and entropy.
4. Based on diagnostic measures, choose final model. If still an unclear choice, look at interpretation of trajectories.
5. For final model, plot the predicted marginal trajectories for each class.
6. Also plot the observed mean values of the outcome among women assigned to latent classes, by timepoint and class, to compare with step 5 plot.

**Figure A 6.1: Histogram of the outcome (Number of days with a SLaM inpatient bed day or outpatient attendance, per quarter), among the study cohort (n = 1709), for all 12 quarters of the observation window.**

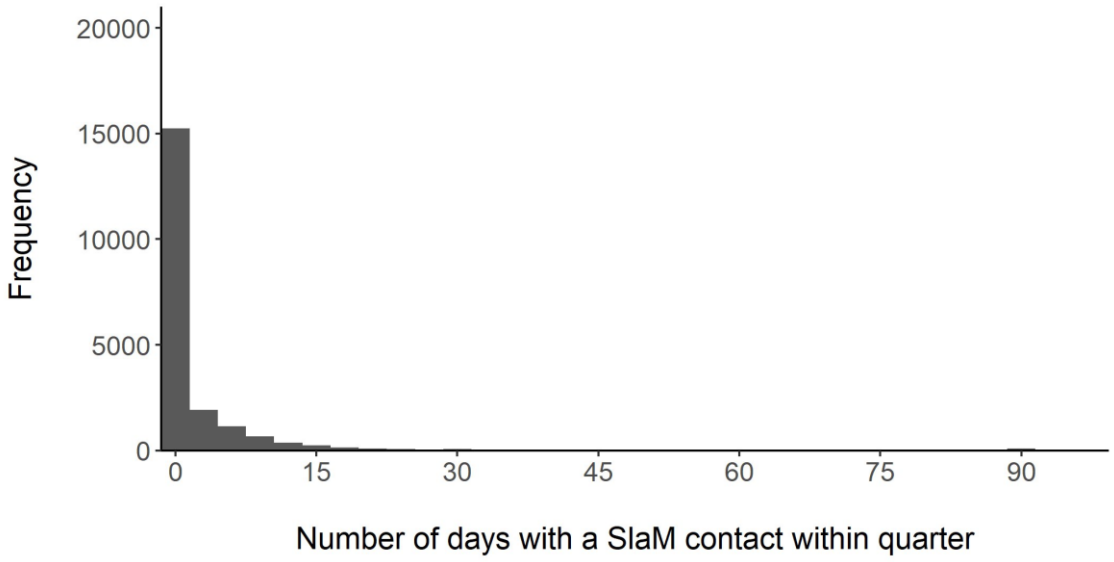


**Table A 6.3: fitting a one-class LCMM to identify the optimum link function**

| Link function | Log-likelihood | Converged? | Number of parameters | AIC | BIC |
|---|---|---|---|---|---|
| Linear | -73826.6 | Yes | 7 | 147667.1 | 147,705.20 |
| Beta | -29145.1 | No | 9 | 58308.1 | 58,357.09 |
| splines (2 knots at quantiles) | -60448.1 | Yes | 9 | 120914.3 | 120,963.30 |
| splines (5 knots - equidistant) | -46435.1 | Yes | 12 | 92894.1 | 92,959.43 |
| splines (5 knot -manually spaced at 0, 1, 3, 15, 92)* | -20607.4 | Yes | 12 | 41238.82 | 41,304.14 |

* interior nodes represent the 70, 80 and 95th quantiles of the outcome distribution.

**Figure A 6.2: Comparing link functions applied to the one-class LCMM**

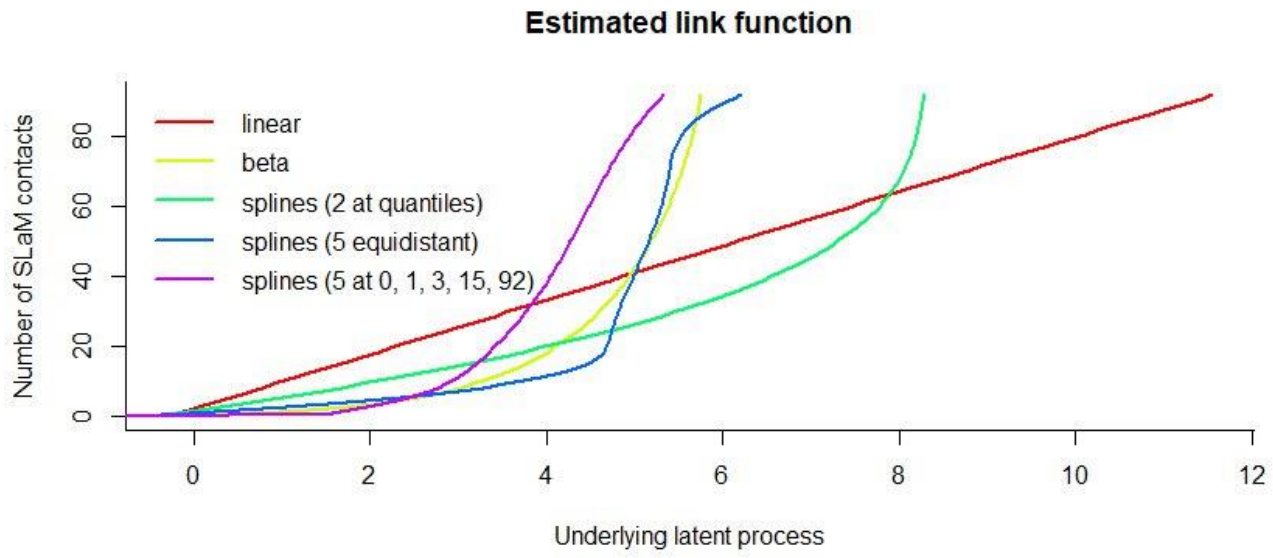


**Figure A 6.4: The percentage of women in the study cohort with an inpatient admission over the observation window.**

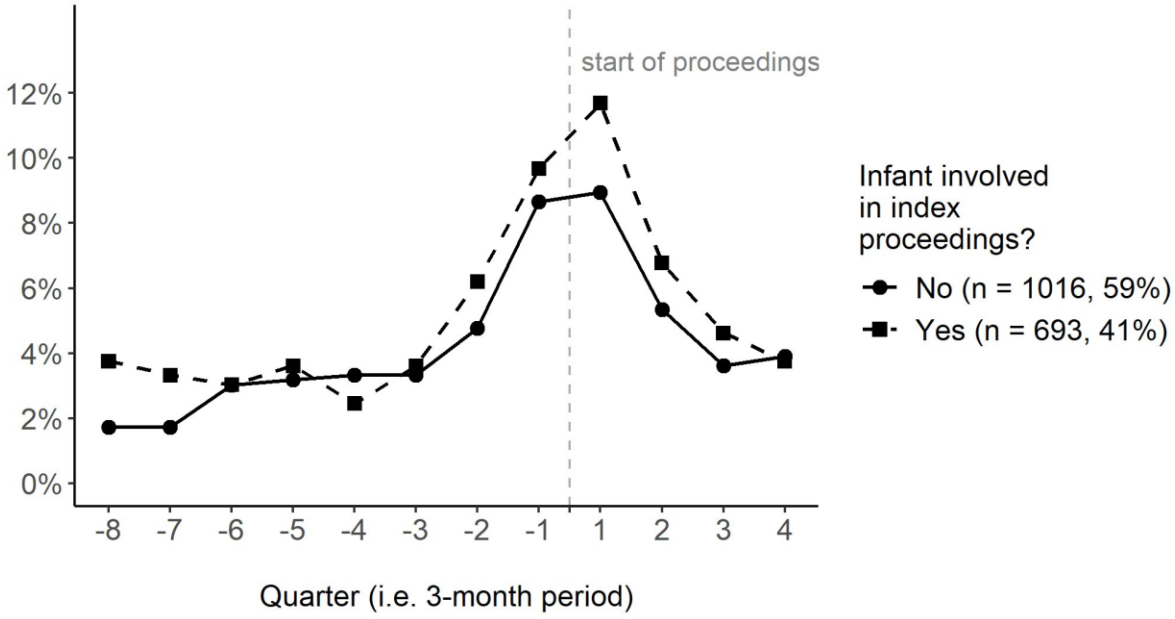



**Figure A 6.3: Percentage of women in the study cohort with an active SLaM referral over the observation window, by electronic patient record system**

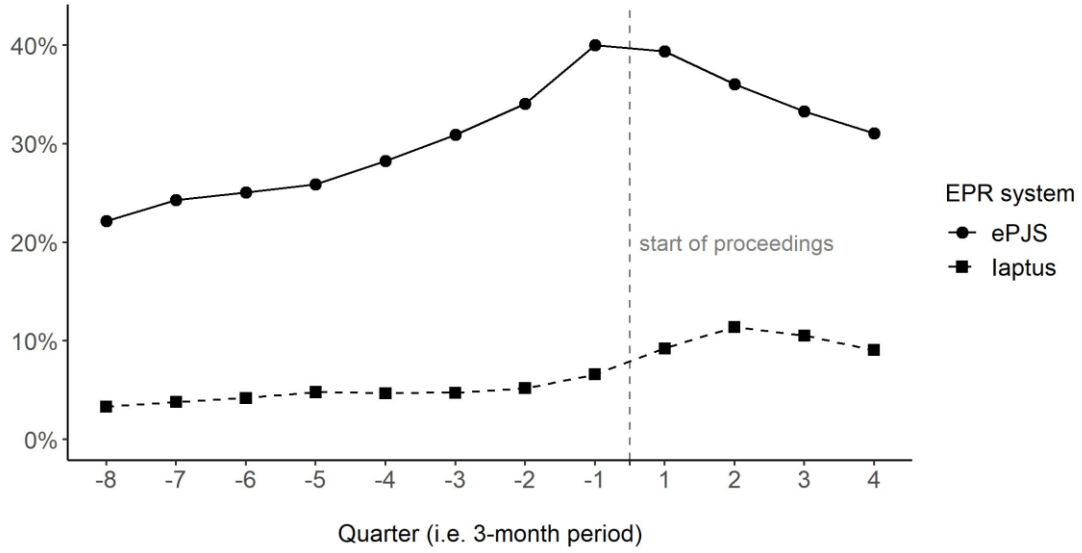


**Table A 6.4: Comparing diagnostic measures for the 1 to 6 class LCMMs**

| | | Number of women assigned to class | | Diagnostic measures | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Number of latent classes | Class | Freq | % | OCC | AvePP | Entropy | Relative Entropy | AIC | BIC |
| 1 | 1 | 1709 | 100.0 | - | - | | | 41239 | 41304 |
| 2 | 1 | 296 | 17.3 | 31.9 | 0.88 | 222 | 0.81 | 40213 | 40305 |
| | 2 | 1413 | 82.7 | 5.4 | 0.96 | | | | |
| 3 | 1 | 320 | 18.7 | 125.6 | 0.97 | 211 | 0.89 | 38679 | 38799 |
| | 2 | 1109 | 64.9 | 13.0 | 0.96 | | | | |
| | 3 | 280 | 16.4 | 36.8 | 0.88 | | | | |
| 4 | 1 | 313 | 18.3 | 119.0 | 0.96 | 286 | 0.88 | 38366 | 38513 |
| | 2 | 119 | 7 | 76.1 | 0.86 | | | | |
| | 3 | 253 | 14.8 | 48.9 | 0.90 | | | | |
| | 4 | 1024 | 59.9 | 11.3 | 0.94 | | | | |
| 5 | 1 | 251 | 14.7 | 243.3 | 0.98 | 291 | 0.89 | 37573 | 37747 |
| | 2 | 121 | 7.1 | 66.7 | 0.84 | | | | |
| | 3 | 138 | 8.1 | 108.5 | 0.90 | | | | |
| | 4 | 962 | 56.3 | 13.6 | 0.94 | | | | |
| | 5 | 237 | 13.9 | 59.5 | 0.91 | | | | |
| 6 | 1 | 217 | 12.7 | 261.9 | 0.97 | 299 | 0.90 | 37142 | 37343 |
| | 2 | 113 | 6.6 | 77.6 | 0.85 | | | | |
| | 3 | 919 | 53.8 | 14.6 | 0.94 | | | | |
| | 4 | 95 | 5.6 | 118.5 | 0.87 | | | | |
| | 5 | 145 | 8.5 | 113.7 | 0.91 | | | | |
| | 6 | 220 | 12.9 | 74.7 | 0.92 | | | | |

OCC = odds of correct classification; AvePP = Average Posterior Probability; AIC = Akaike's Information Criterion; BIC = Bayes Information Criterion.

**Figure A 6.5: Mean predicted trajectories of the outcome from the 1 to 6 class LCMMs**

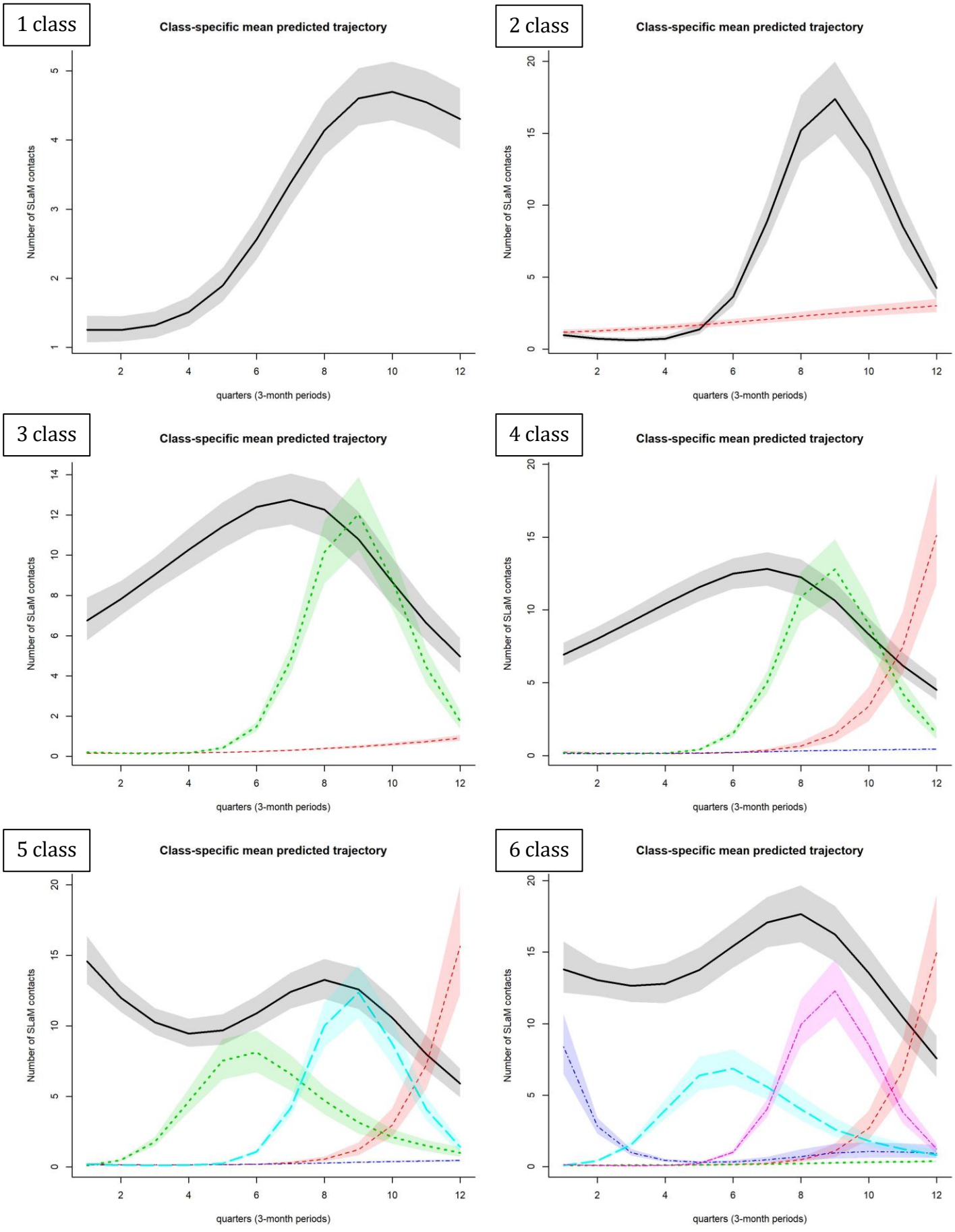
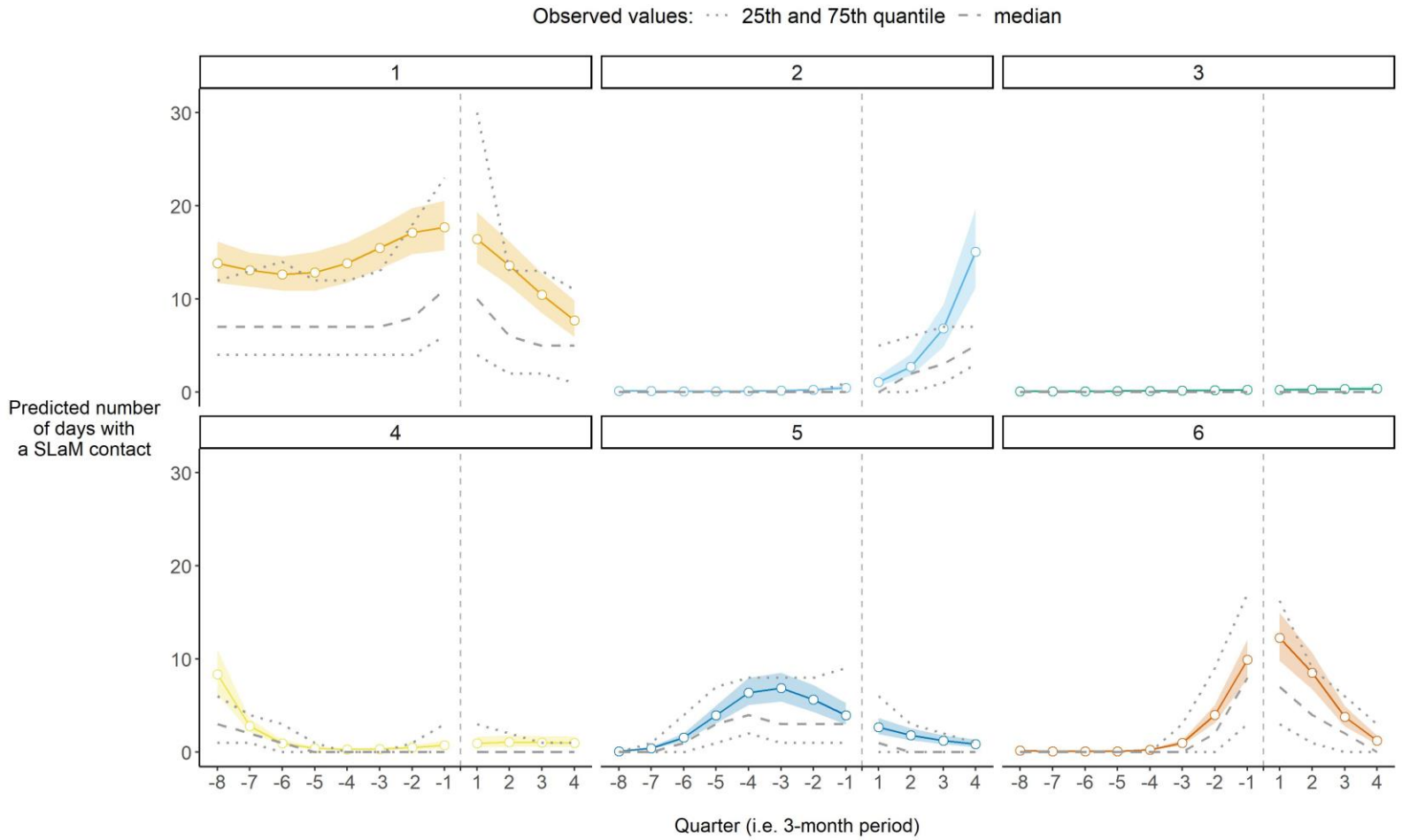


**Figure A 6.6: Plot of predicted trajectories vs Observed trajectories.**




Note: the coloured line and intervals are the 50%, 2.5% and 97.5% percentiles of the approximated posterior distribution of the class-specific predicted values from the final 6-class LCMM.

**Final model specification:**

$$Number\ of\ days\ with\ a\ SLaM\ contact_{ij} = H\left(f(quarter_j) + \mu_{0i} + \mu_{1i} quarter_j\right)$$

$$for\ c = 1, \dots, 6\ classes,$$

$$i = 1, \dots, 1709\ individuals,$$

$$j = 1, \dots, 12\ quarters$$

$H$ is a parameterized link function. In this model, $H$ is an I-splines link function with five nodes, the interior nodes have been chosen to represent the 70, 80 and 95th quantiles of the outcome distribution.

The function $f(x)$ is a Natural cubic spline function, with three knots:

$$f\left(quarter_j\right) = \beta_{0i}^c + \beta_{1i}^c quarter_j + \beta_{2i}^c {quarter_j}^2 + \beta_{3i}^c {quarter_j}^3 + \beta_{4i}^c (quarter_j - \tau_1)^3 + \beta_{5i}^c (quarter_j - \tau_2)^3 + \beta_{6i}^c (quarter_j - \tau_3)^3$$

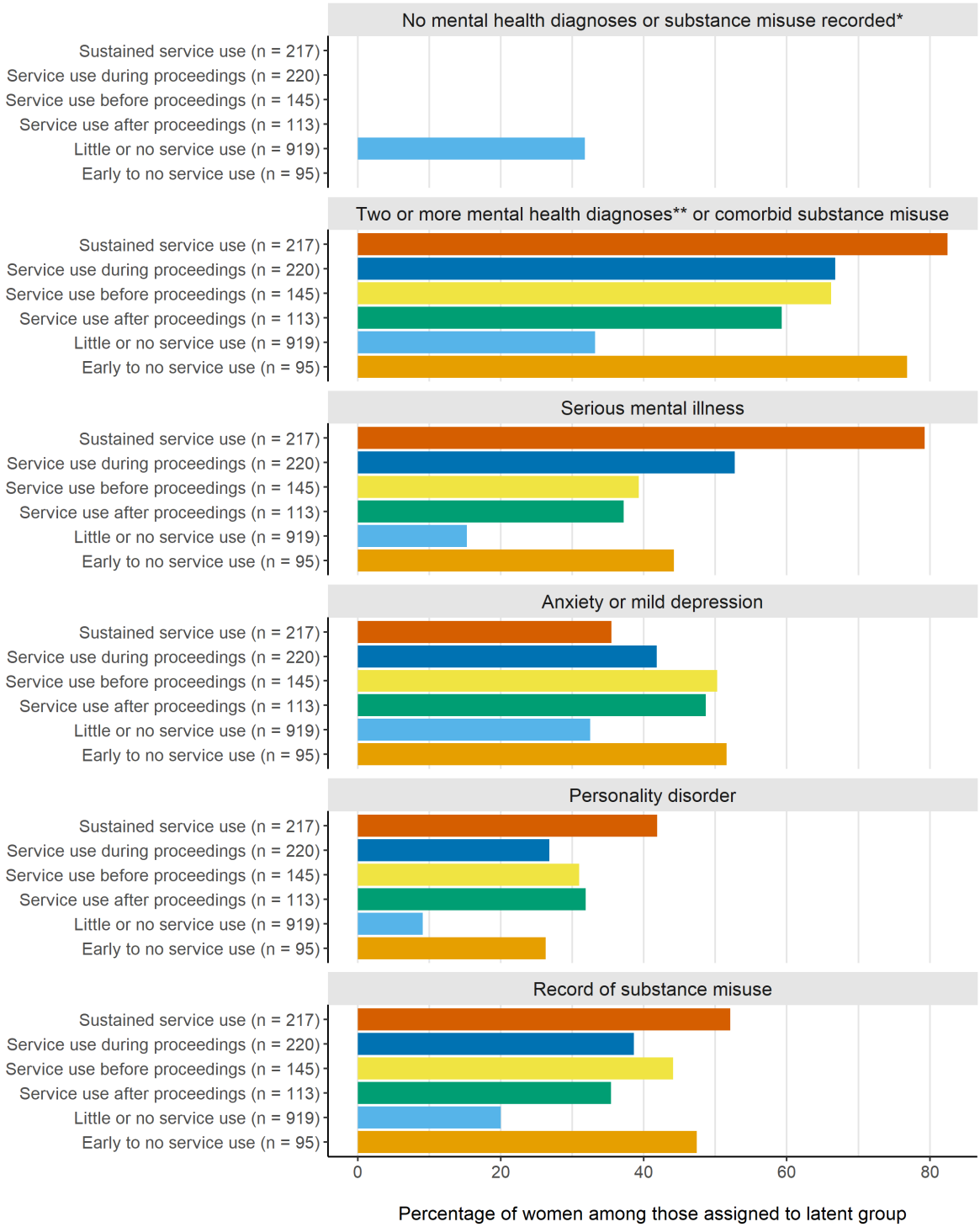
The random-effects $\mu_0$ (intercept parameter) and $\mu_1$(slope parameter) are specified as follows:

$$\mu_i = \begin{pmatrix} \mu_{0i} \\ \mu_{1i} \end{pmatrix} \sim N(0, \Omega_u)$$

Where:

$$\Omega_u = \begin{bmatrix} \Omega_0 & 0 \\ 0 & \Omega_1 \end{bmatrix}$$

**Figure A 6.7: Mental health diagnoses and substance misuse among the study cohort (n = 1709), by latent class assignment**




* Where counts were smaller than 10, percentages were supressed.
** Excluding ICD-10 F1 diagnoses (disorders related to alcohol or drug use).

# Appendix 7. Chapter 7

**Table A 7.1: Incidence of returning to court with a subsequent child among women whose index set of care proceedings occurred in the SLaM catchment between 1 April 2008 and 31 March 2018 (n = 2533)**

| | Number of women with a subsequent set of care proceedings involving children born following onset of index proceedings | | |
|---|---|---|---|
| | Return with an infant (< 1 year old) | Return with only older children (1-17 years old) | Total |
| Returned at any time | 331 (87.3%) | 48 (12.7%) | 379 |
| Returned within 37 weeks of index | 309 (100%) | 0 (0%) | 309 |

Note: percentages are calculated from the total column

**Table A 7.2: Incidence of returning to court with a subsequent infant (at least 37 weeks after index) among women whose index set of care proceedings occurred in the SLaM catchment between 1 April 2008 and 31 March 2018 (n = 2533), by linkage status**

| Linkage status | Number who returned to court | Total |
|---|---|---|
| Non link (n = 831) | 46 (5.5%) | 831 |
| Link (n = 1702) | 263 (15.5%) | 1702 |
| Overall | 309 (12.2%) | 2533 |

Note: percentages are calculated from the total column

**Figure A 7.1: Distribution of the age of infants involved in returns to court among women whose index set of care proceedings occurred in the SLaM catchment between 1 April 2008 and 31 March 2018 and who returned to court with a subsequent infant at any time (n = 331)**

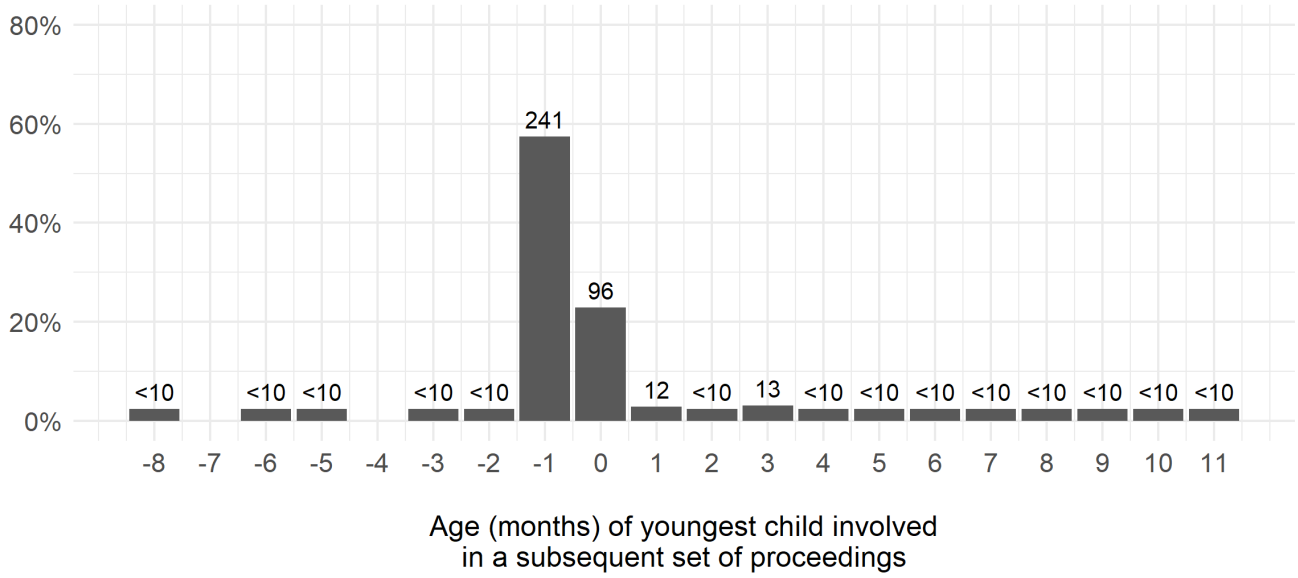


**Table A 7.3: Characteristics among the study cohort (n = 1471), stratified by whether women had any missing values**

| Characteristics | Overall (n = 1471) | No missing data (n = 1190) | Some missing data (n = 281) |
|---|---|---|---|
| Follow-up time | 5.59 [2.98, 7.69] | 5.57 [2.93, 7.64] | 5.70 [3.27, 8.08] |
| **Local Authority bringing index proceedings:** | | | |
| Croydon | 309 (21.0) | 239 (20.1) | 70 (24.9) |
| Lambeth | 370 (25.2) | 309 (26.0) | 61 (21.7) |
| Lewisham | 380 (25.8) | 310 (26.1) | 70 (24.9) |
| Southwark | 412 (28.0) | 332 (27.9) | 80 (28.5) |
| Died over follow-up | 51 ( 3.5) | 38 ( 3.2) | 13 ( 4.6) |
| Age (years) at index proceedings | 31.41 [24.09, 38.31] | 31.96 [24.57, 38.43] | 29.50 [22.11, 37.35] |
| Age (years) of youngest child at index proceedings | 1.85 [0.11, 7.12] | 1.92 [0.11, 7.26] | 1.39 [0.11, 6.61] |
| **Number of children at index proceedings:** | | | |
| 1 | 928 (63.1) | 730 (61.3) | 198 (70.5) |
| 2 | 302 (20.5) | 249 (20.9) | 53 (18.9) |
| 3 | 138 ( 9.4) | 120 (10.1) | 18 ( 6.4) |
| 4 or more | 103 ( 7.0) | 91 ( 7.6) | 12 ( 4.3) |
| **Ethnicity:** | | | |
| Black or Black British | 493 (34.2) | 408 (34.3) | 85 (33.6) |
| Mixed | 110 ( 7.6) | 91 ( 7.6) | 19 ( 7.5) |
| Other | 134 ( 9.3) | 108 ( 9.1) | 26 (10.3) |
| White | 706 (48.9) | 583 (49.0) | 123 (48.6) |
| **Father party at index proceedings** | 820 (55.7) | 677 (56.9) | 143 (50.9) |
| **IMD:** | | | |
| 1 (most deprived) | 636 (48.7) | 583 (49.0) | 53 (46.1) |
| 2 | 475 (36.4) | 428 (36.0) | 47 (40.9) |

| | | | |
|---|---|---|---|
| 3, 4 or 5 (least deprived) | 194 (14.9) | 179 (15.0) | 15 (13.0) |
| **Final legal order of youngest child at index proceedings:** | | | |
| Remained or returned home | 351 (25.6) | 309 (26.0) | 42 (23.0) |
| Placed into out-of-home care | 336 (24.5) | 299 (25.1) | 37 (20.2) |
| Placed for adoption | 231 (16.8) | 197 (16.6) | 34 (18.6) |
| Placed with extended family | 455 (33.1) | 385 (32.4) | 70 (38.3) |
| Experienced the primary outcome over follow-up | 219 (14.9) | 186 (15.6) | 33 (11.7) |
| **Recorded in the three years before to 3 months after onset of index proceedings** | | | |
| Any inpatient admission | 309 (21.0) | 246 (20.7) | 63 (22.4) |
| Number of inpatient admissions* | 1.00 [1.00, 2.00] | 1.00 [1.00, 2.00] | 2.00 [1.00, 2.00] |
| Total number of inpatient bed days* | 19.00 [3.00, 71.00] | 17.00 [3.00, 64.50] | 31.00 [2.00, 87.00] |
| Any mental health disorder diagnosis or substance use record | 1106 (75.2) | 898 (75.5) | 208 (74.0) |
| **Types of diagnoses** | | | |
| Schizophrenia, schizotypal and delusional disorders | 250 (17.0) | 195 (16.4) | 55 (19.6) |
| Bipolar, severe/moderate depressive disorders | 272 (18.5) | 227 (19.1) | 45 (16.0) |

| | | | |
|---|---|---|---|
| Anxiety, somatoform, and stress-related disorders | 297 (20.2) | 244 (20.5) | 53 (18.9) |
| Other depressive disorders | 147 (10.0) | 119 (10.0) | 28 (10.0) |
| Personality disorders | 185 (12.6) | 148 (12.4) | 37 (13.2) |
| Alcohol and drug-related disorders | 362 (24.6) | 301 (25.3) | 61 (21.7) |
| Other psychiatric disorders** | 136 ( 9.2) | 102 ( 8.6) | 34 (12.1) |
| **Number of mental health diagnosis types recorded:** | | | |
| 0 | 375 (25.5) | 300 (25.2) | 75 (26.7) |
| 1 | 528 (35.9) | 424 (35.6) | 104 (37.0) |
| 2-3 | 422 (28.7) | 344 (28.9) | 78 (27.8) |
| 4 or more | 146 ( 9.9) | 122 (10.3) | 24 ( 8.5) |
| **Number of substance types recorded** | | | |
| 0 | 1148 (78.0) | 927 (77.9) | 221 (78.6) |
| 1 | 112 ( 7.6) | 91 ( 7.6) | 21 ( 7.5) |
| 2 or more | 211 (14.3) | 172 (14.5) | 39 (13.9) |
| **Types of substances recorded** | | | |
| Alcohol | 174 (11.8) | 144 (12.1) | 30 (10.7) |
| Cannabis | 143 ( 9.7) | 118 ( 9.9) | 25 ( 8.9) |
| Cocaine | 179 (12.2) | 147 (12.4) | 32 (11.4) |
| Opioids | 148 (10.1) | 119 (10.0) | 29 (10.3) |
| Other substances | 62 ( 4.2) | supressed | < 10 |
| Both a mental health disorder diagnosis (excluding substance-related disorders) AND a recorded **substance** | 208 (14.1) | 168 (14.1) | 40 (14.2) |

| |
|---|
| type or a substance-<br>related mental health<br>disorder |

* Medians and 25th/75th percentiles are calculated from the subset of women with at least one inpatient admission. Note: 25th/75th Percentiles have been suppressed where the number of women is less than 40.

* Includes disorders with onset usually in childhood and adolescence.

Note: Counts under 10 have not been reported to adhere to disclosure rules. Similarly, where these counts could be derived from row or column totals, at least one other count from both the row and column have been supressed.

**Figure A 7.2: Martingale residual plots from univariable Cox models with continuous predictors to assess departures from linearity.**

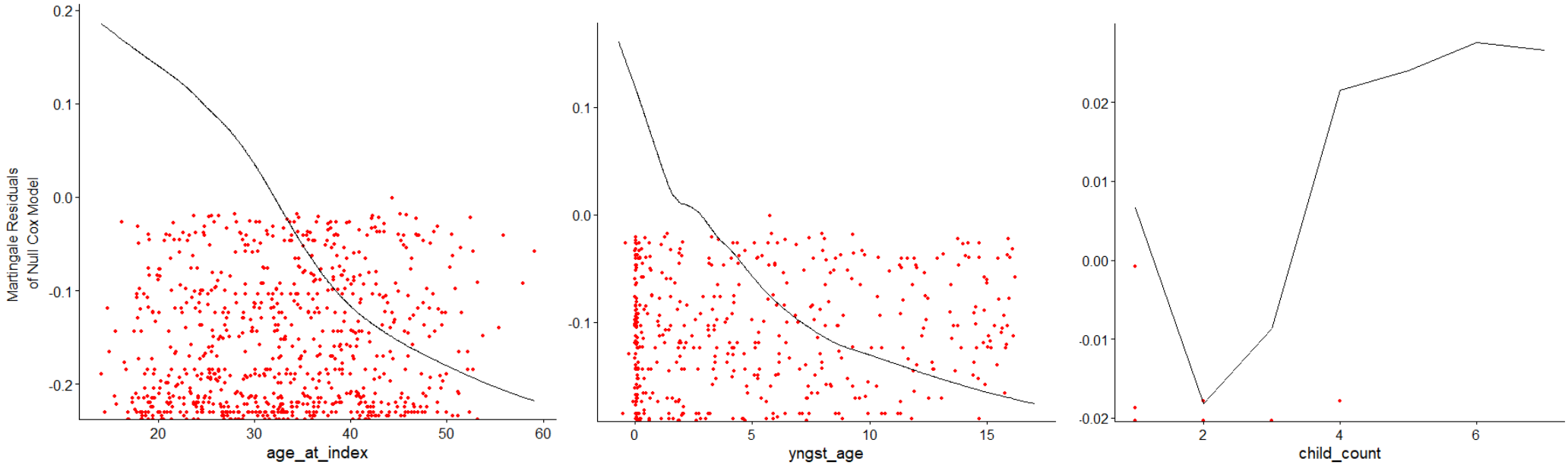


**Figure A 7.3: Schoenfeld residual plots (from the final Cox model)**

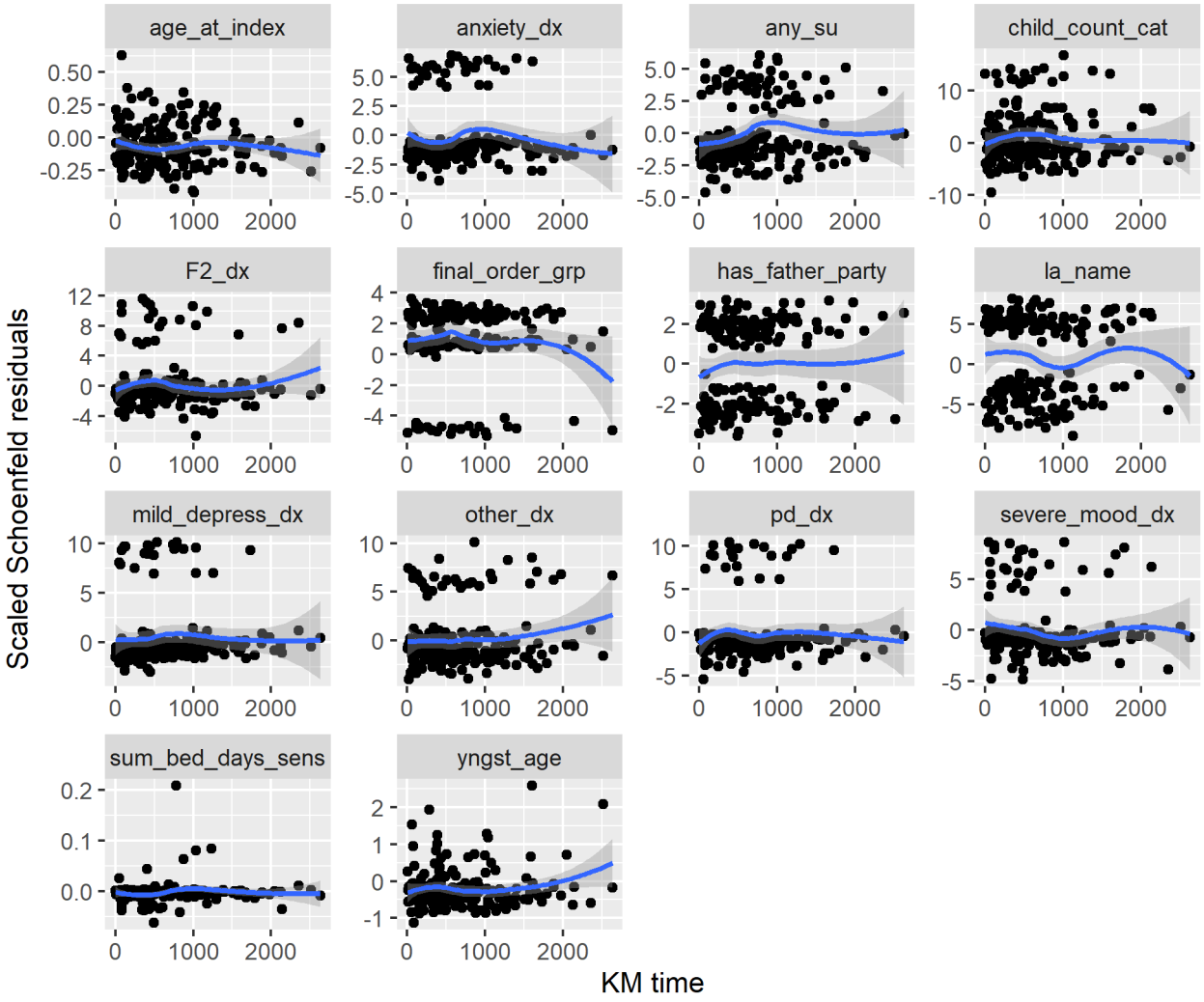
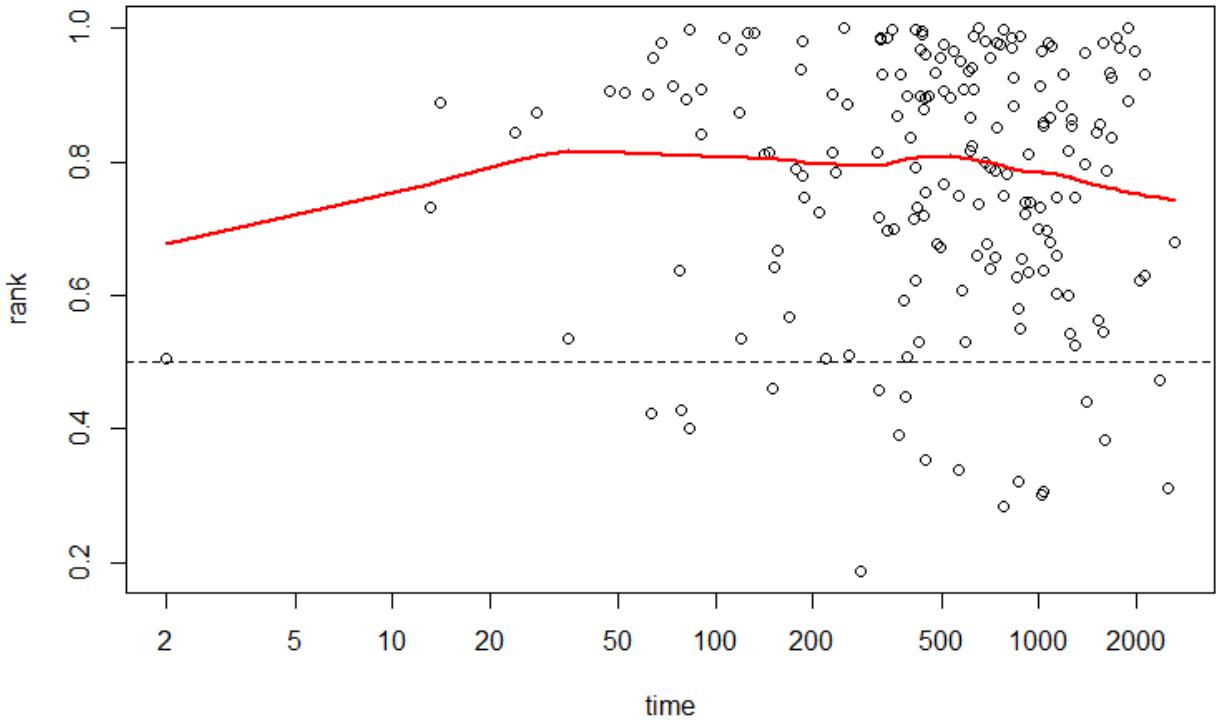
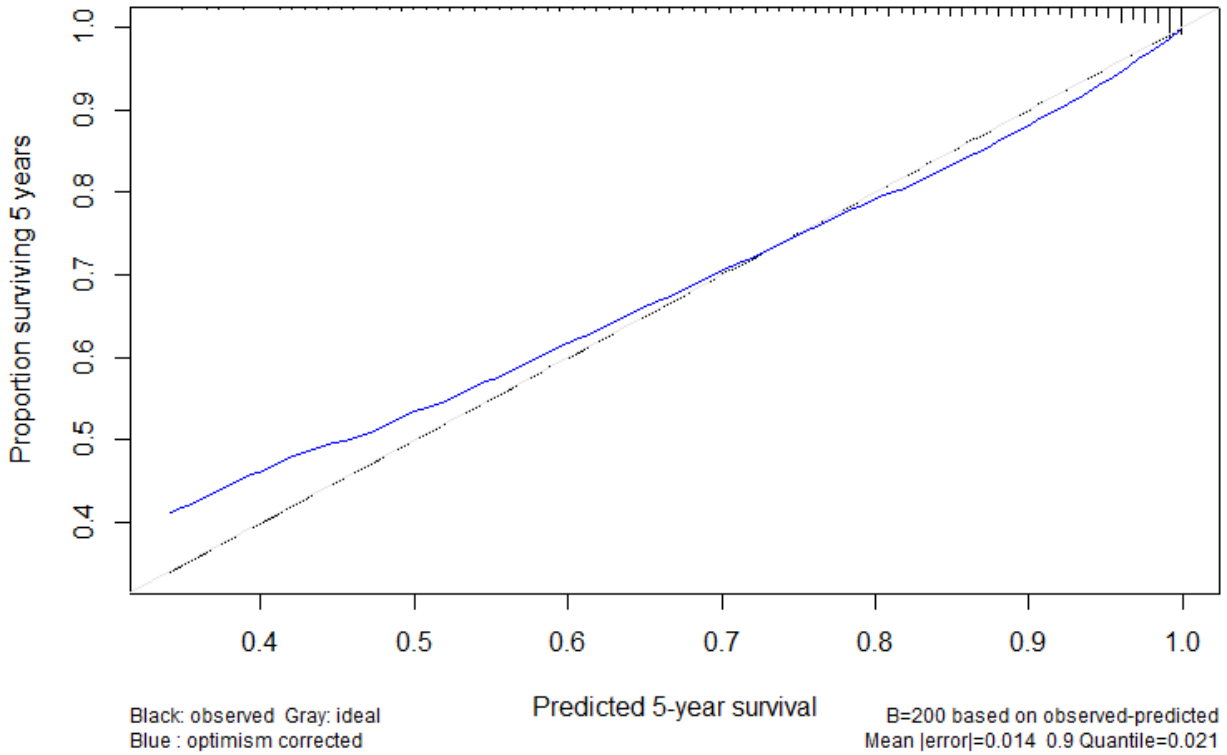


**Figure A 7.4: Concordance over time (from the final Cox model)**




The y-axis gives the rank of each of the risk score for each subject who had an outcome event, among all those at risk. The rank of the risk score for each subject with an outcome event ranges from 0 to 1, where 1= the subject with an outcome event had the highest risk score at that time and 0 = lowest. In a Cox model with high predictive accuracy, the subjects with the highest risk scores would be the ones having the outcome event soonest. The red line is the concordance over time (i.e., the weighted average of the ranks over time).This plot shows that the concordance remained high over the time period plotted (0-2000 days i.e., approx. 5 years from entering at-risk period)

**Figure A 7.5: Calibration plot (from the final Cox model)**




Bootstrap estimate of calibration accuracy for 5-year estimates from final Cox model. Black line is apparent predictive accuracy and blue line is bootstrap-corrected estimates. Grey line shows ideal relationship. Suggests model is slightly underestimating low survival probabilities but otherwise had good accuracy.

**Table A 7.4: Model results from the final Cox model (n = 1189)**

| Predictor variable | Coefficient estimate (Hazard ratio) | 95% confidence interval | P-value |
|---|---|---|---|
| Age (years) at index | 0.94 | 0.91 to 0.96 | <0.01 |
| Age (years) of youngest child at index | 0.82 | 0.75 to 0.88 | <0.01 |
| Father party status at index | 0.94 | 0.69 to 1.27 | 0.673 |
| Number of children at index: | | | |
| 1 child (reference level) | 1.00 | | |
| 2 children | 1.31 | 0.88 to 1.95 | 0.19 |
| 3 children | 1.52 | 0.87 to 2.66 | 0.14 |
| 4 or more children | 2.00 | 1.16 to 3.44 | 0.01 |
| Final order of youngest child at index: | | | |
| Remained or returned home (reference level) | 1.00 | | |
| Placed in out-of-home care | 3.94 | 2.25 to 6.89 | <0.01 |
| Placed for adoption | 3.85 | 2.38 to 6.25 | <0.01 |
| Placed with extended family | 2.75 | 1.70 to 4.43 | <0.01 |
| Number of SLaM inpatient bed days before/during index | 1.00 | 0.99 to 1.00 | 0.13 |
| Schizophrenia, schizotypal, delusional disorder diagnosis before/during index | 1.12 | 0.68 to 1.84 | 0.65 |
| Bipolar, severe/moderate depressive disorder diagnosis before/during index | 1.01 | 0.66 to 1.55 | 0.97 |
| Anxiety disorder diagnosis before/during index | 0.82 | 0.55 to 1.22 | 0.32 |
| Other depressive disorder diagnosis before/during index | 1.61 | 1.01 to 2.55 | 0.05 |
| Personality disorder diagnosis before/during index | 0.85 | 0.53 to 1.37 | 0.51 |

| | | | |
|---|---|---|---|
| Other mental health disorder diagnosis before/during index | 1.10 | 0.72 to 1.70 | 0.66 |
| Substance misuse record before/during index | 0.92 | 0.65 to 1.32 | 0.66 |
| Local authority at index: | | | |
| Croydon (reference level) | 1.00 | | |
| Lambeth | 0.61 | 0.38 to 0.97 | 0.04 |
| Lewisham | 0.68 | 0.44 to 1.06 | 0.09 |
| Southwark | 0.96 | 0.64 to 1.44 | 0.83 |

Note: there were 186 primary outcome events

**Table A 7.5: Model results from the sensitivity analysis (n = 1189)**

| Predictor variable | Coefficient estimate (Hazard ratio) | 95% confidence interval | P-value |
|---|---|---|---|
| Age (years) at index | 0.94 | 0.92 to 0.96 | <0.01 |
| Age (years) of youngest child at index | 0.81 | 0.76 to 0.87 | <0.01 |
| Father party status at index | 0.85 | 0.64 to 1.12 | 0.74 |
| Number of children at index: | | | |
| 1 child (reference level) | 1.00 | | |
| 2 children | 1.17 | 0.8 to 1.71 | 0.15 |
| 3 children | 1.39 | 0.82 to 2.34 | 0.16 |
| 4 or more children | 1.68 | 0.99 to 2.86 | 0.04 |
| Final order of youngest child at index: | | | |
| Remained or returned home (reference level) | 1.00 | | |
| Placed in out-of-home care | 2.73 | 1.7 to 4.38 | <0.01 |
| Placed for adoption | 2.31 | 1.54 to 3.46 | <0.01 |
| Placed with extended family | 1.89 | 1.27 to 2.8 | <0.01 |
| Number of SLaM inpatient bed days before/during index | 1 | 0.99 to 1 | 0.16 |
| Schizophrenia, schizotypal, delusional disorder diagnosis before/during index | 1.02 | 0.65 to 1.61 | 0.55 |
| Bipolar, severe/moderate depressive disorder diagnosis before/during index | 1.06 | 0.71 to 1.57 | 0.82 |
| Anxiety disorder diagnosis before/during index | 0.8 | 0.55 to 1.17 | 0.28 |
| Other depressive disorder diagnosis before/during index | 1.44 | 0.92 to 2.26 | 0.07 |
| Personality disorder diagnosis before/during index | 0.86 | 0.55 to 1.35 | 0.94 |

| | | | |
|---|---|---|---|
| Other mental health disorder diagnosis before/during index | 1.07 | 0.71 to 1.59 | 0.68 |
| Substance misuse record before/during index | 1 | 0.72 to 1.39 | 0.63 |
| Local authority at index: | | | |
| Croydon (reference level) | 1.00 | | |
| Lambeth | 0.63 | 0.41 to 0.96 | 0.02 |
| Lewisham | 0.71 | 0.47 to 1.07 | 0.07 |
| Southwark | 0.95 | 0.65 to 1.39 | 0.69 |

Note: there were 218 secondary outcome events