Teenage pregnancy among care experienced young people in Fife: a data linkage study

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Research data/digital outputs access statement

The study for this thesis links existing secondary sources of data only. Due to the sensitive nature of the data, all the data remain within the National Safe Haven.

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Abbreviations

ACE	Adverse childhood experience
CEYP	Care experienced young people
CHI	Community Health Index
CI	Confidence interval
CLAS	Children Looked After Survey
CMO	Chief Medical Officer
CPS	Child Protective Services
CWS	Child Welfare Services
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, 4th Edition
eDRIS	electronic Data Research and Innovation Service
FPS	Family Preservation Services
HDI	Human Development Index
HR	Hazard ratio
ICD	International Classification of Diseases
IHC	In-home care
LAC	Looked after children
LACYP	Looked after children and young people
LAYP	Looked after young people
NHS	National Health Service
Non-CEYP	Non-care experienced young people
NRS	National Records of Scotland
OHC	Out-of-home care
OR	Odds ratio
RCT	Randomised controlled trial
RECORD	REporting of studies Conducted using Observational Routinely-collected health Data
RR	Relative risk
SIMD	Scottish Index of Multiple Deprivation
SMR	Scottish Morbidity Record
SWIFT	Social Work Information Technology

SWIS	Social Work Information System
UK	United Kingdom
US	United States of America

Abstract

Background

Care experienced young people (CEYP) are thought to be at increased risk of experiencing teenage pregnancy but little is known about teenage pregnancy rates among CEYP in Scotland.

Objectives

The study used data linkage techniques to compare teenage pregnancy outcomes for CEYP in Fife with those of their non-care experienced but similarly deprived peers.

Methods

Social care administrative data for 1119 females looked after by Fife Council between October 1991 and March 2015 were linked to NHS teenage pregnancy data. Probabilistic linkage was used to match CEYP demographic data (names, sex, date of birth and postcodes) to the Community Health Index (CHI) number. The CHI number was used to identify teenage pregnancy outcomes from national Scottish Morbidity Record (SMR) datasets, SMR01 and SMR02. Outcomes for CEYP were compared with a group of non-care experienced peers from a similar socioeconomic background. Three non-care experienced young people (non-CEYP) were selected for every CEYP, matched by year of birth, sex and socioeconomic status at birth.

Results

An acceptable match to a CHI number was achieved for 90.5% (1013/1119) of CEYP. 889 CEYP were fully matched to 2664 non-CEYP.

CEYP were more than twice as likely as non-CEYP to experience a live birth before age 20 (RR 2.32, 95% CI 2.06 to 2.62). 38.4% (341/889) of CEYP had a live birth before age 20, compared with 16.5% (440/2664) of non-CEYP ($p<0.001$).

CEYP were 33% more likely than non-CEYP to experience a termination of pregnancy before age 20 (RR 1.33, 95% CI 1.06 to 1.66). 11.2% (100/889) of CEYP experienced a

termination of pregnancy before age 20, compared with 8.5% (226/2664) of non-CEYP ($p<0.05$).

Conclusions

CEYP were significantly more likely to experience teenage abortion and teenage childbirth than their non-care experienced but similarly deprived peers. High levels of teenage childbirth were observed among CEYP.

Chapter 1: Introduction

1.1 Overview

This thesis examines whether care experienced young people (CEYP) in Fife are more likely to experience teenage pregnancy than their non-care experienced peers. This chapter describes the importance of health inequalities among CEYP and the role of corporate parents in improving outcomes for CEYP. It then outlines the challenges of identifying health outcomes for CEYP in Scotland, the potential role of cross-sectoral data linkage to identify health outcomes and the development of a cross-sectoral data linkage study to examine teenage pregnancy outcomes for CEYP in Fife.

1.2 Health inequalities in Scotland

Reducing health inequalities is a key challenge for Scotland (Scottish Government, 2008a; 2014) with early childhood recognised as a key time for influencing early inequalities and improving longer term outcomes (Dodds, 2016; Scottish Government, 2008b). Looked after children (i.e. children and young people in the care of their local authority) have poorer mental and physical health than their general population peers, with health inequalities potentially persisting into later life (CELCIS, 2014a). Improving outcomes and life chances for looked after children (LAC) in Scotland is therefore a key part of tackling health inequalities in Scotland, with its importance recognised in national policy:

> "Tackling inequality is at the heart of the Scottish Government's commitment to creating a better country for all… The Scottish Government seeks to provide opportunities for all to flourish and to remove barriers which prevent people from achieving their full potential. Improving the life chances and outcomes for looked after children and young people is crucial if we are to tackle inequality. These children and young people face some of the biggest barriers to achieving their potential." (Scottish Government, 2015a, p.2).

1.3 The varied experiences of CEYP

The needs and experiences of CEYP vary considerably. Given the uniqueness of each young person's experience, one should be cautious of characterising the "average" care experience or care experienced young person. However, many CEYP will have experienced events or circumstances which make them more vulnerable to harm and at greater risk of poorer outcomes than their non-looked after peers[1] (Public Health England, 2020, p.8). The risk factors contributing to vulnerability may be multiple, complex and interrelated (Public Health England, 2020) and disadvantage experienced by young people before entering care may be mitigated or exacerbated by their experience in care. Resilience factors are also important, however, with some LAC doing well despite the adverse circumstances they experience (Rees, 2013).

Children enter care for a variety of reasons (Scottish Government, 2020a; 2021a). Some experience only a brief episode in care while others experience a single, long-term placement and others experience multiple episodes of care throughout their childhood. On leaving care, most children return home to their biological parents (Scottish Government, 2021a). Others may go to live with friends, relatives or former foster carers and a small proportion are adopted. Some older care leavers go onto supported accommodation or their own tenancy. For those remaining in care until they 'age out' of the care system from age 16 onwards the transition to adulthood can be particularly challenging (Scottish Government, 2013a), with care leavers expected to make the transition to independent living at a much earlier age than their non-looked after peers (Duncalf, Hill and McGhee, 2013).

1.4 The Corporate Parenting principle

The need to understand and improve the experiences of and outcomes for CEYP in Scotland has become increasingly prominent in national policy in recent years. This is reflected in the publication of key national policy documents such as *Looked after children and young people: We can and must do better* (Scottish Executive, 2007), *These Are Our Bairns* (Scottish Government, 2008c) and *Getting it right for looked*

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[1] "Vulnerable children" are defined as "children at greater risk of experiencing physical or emotional harm and/or experiencing poor outcomes because of one or more factors in their lives" (Public Health England, 2020, p.6).

after children and young people (Scottish Government, 2015a) and more recently through the independent 'root and branch' review of the care system in Scotland (Independent Care Review, 2020). A key principle underpinning current policy is for agencies to work together as corporate parents to meet the needs of CEYP[2] (Scottish Executive, 2007) and for corporate parents to expect the same outcomes for CEYP as a good parent would want for their own children (Scottish Government, 2008c, p.3). This includes health outcomes.

1.5 Using data to understand and improve health outcomes for CEYP

Health boards, local authorities and other partner agencies are increasingly working together (through local Corporate Parent Boards, for example) to try to improve health outcomes for CEYP in their local area. However, despite improvements in interagency working and the desire to understand and improve health outcomes for CEYP, there is often insufficient data on which to base local policy decisions. National data on health outcomes for CEYP in Scotland is notably lacking (Scott, Hattie and Tannahill, 2013; Scottish Government, 2013b) and undertaking research among CEYP can be difficult (Dale and Watson, 2010; Mezey, et al., 2015). Alternative approaches are therefore needed. One potential solution is to link existing data sources. While health and social care agencies often individually hold relevant data for CEYP, this is not currently routinely linked together to assess health outcomes. Linking existing health and social care data could however provide a useful way of identifying valuable information on health outcomes for CEYP.

1.6 Cross-sectoral data linkage to identify health outcomes for CEYP

This thesis describes a cross-sectoral data linkage study linking National Health Service (NHS) and social care data for CEYP in Fife. Scotland is fortunate in having high quality, routinely collected health service data with the ability to link different health records together and health record linkage has been successfully used for many years in

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[2] "Corporate parent" is the term used in Scotland to refer to "organisations (and individuals who work for them) who have a legal duty to respond to and support the care and protection needs of all children and young people" (Scottish Government, 2021b, p.4). "Corporate parenting" is defined as "the formal and local partnerships needed between all local authority departments and services, and associated agencies, who are responsible for working together to meet the needs of looked after children and young people" (Scottish Executive, 2007, p.3). The duties of corporate parents are laid out in the Children and Young People (Scotland) Act 2014.

Scotland to answer a wide range of medical research questions (Fleming, Kirby and Penny, 2012). Linking health service data to data from other sectors, such as social care, offers the potential to answer even broader questions and interest in cross-sectoral data linkage has increased in Scotland in recent years. For example, the Scottish Government has promoted cross-sectoral data linkage as a way of making better use of existing data to improve decision making and deliver better outcomes for service users (Scottish Government, 2012; 2015b). There has also been significant investment in the national infrastructure for data linkage (Pavis and Morris, 2015) through developments such as Health Data Research UK and increasing interest in 'big data' (Connelly, et al., 2016).

Cross-sectoral data linkage has already been used nationally to identify certain outcomes for CEYP. For example, education and social work data are now linked regularly to identify and track educational outcomes for looked after young people (LAYP) compared with the general population (Scottish Government, 2020b). It has also been used successfully in a national demonstration project linking social care, education and dental health data to show poorer dental health among LAC compared with the general population (Clark, et al., 2017; McMahon, et al., 2018). More recently, social care, education and NHS data have been linked to examine a range of health outcomes and health service use for care experienced children compared with their general population peers in the first national longitudinal study of its kind in Scotland (Allik, et al., 2021). These examples show that cross-sectoral data linkage offers a way to bring together existing data from different organisations to identify health outcomes for CEYP. The findings can then be used to identify inequalities and monitor progress towards improving health outcomes. However, as this thesis will demonstrate, linking data from different public sector organisations is not without its difficulties.

1.7 Teenage pregnancy rates among CEYP in Scotland

This thesis describes the cross-sectoral data linkage of health and social care data to examine teenage pregnancy outcomes for CEYP in Fife. Teenage pregnancy is an important issue for young people generally and for CEYP in particular due to the additional challenges CEYP may face in both preventing unplanned teenage pregnancy and as young parents. However, despite its importance, little is known about teenage pregnancy rates among CEYP in Scotland. Data on teenage pregnancy among CEYP is not currently routinely collected at a health board, local authority or national level. Knowledge of teenage pregnancy rates among CEYP in Scotland relies instead on national data from elsewhere in the United Kingdom (UK), from UK or international studies or on tacit knowledge. However, the existing UK literature is either now too dated or insufficiently robust to allow reliable estimates of teenage pregnancy risk among CEYP in Scotland. The data linkage study described in this thesis was therefore developed to help fill this gap in our knowledge.

1.8 Thesis outline

This thesis describes the data linkage study and supporting work:

- Chapter 2 expands on how CEYP become looked after and the issues they may face, before exploring why teenage pregnancy among CEYP is an important issue and what is already known about teenage pregnancy rates among CEYP in the UK.
- Chapter 3 presents a systematic review of international literature comparing the frequency of teenage pregnancy among CEYP in the UK and other very high Human Development Index countries with their non-care experienced peers.
- Chapters 4 and 5 describe the development of a data linkage study linking social care data for children looked after by Fife Council between October 1991 and March 2015 with routine NHS maternity and hospital data, to identify teenage pregnancy outcomes for CEYP in Fife, compared with a group of non-care experienced peers from a similar socioeconomic background. Chapter 4 describes the local context for the development of the study while Chapter 5 describes the methods.
- Chapters 6 and 7 present the results of the data linkage study while Chapter 8 describes the challenges involved in the data linkage process.
- Finally, chapters 9 and 10 discuss the findings and their implications.

Chapter 2: Background

2.1 Overview

This chapter describes how CEYP in Scotland become looked after and the health issues they may face. It then describes why teenage pregnancy among CEYP is an important issue and what is currently know about teenage pregnancy rates among CEYP in Scotland.

2.2 Legal definition of Looked After Children in Scotland

The term 'looked after children' refers to children in the care of their local authority (Scottish Government, 2021a) i.e. children in State or public care. The legal definition varies between UK countries (McGhee, et al., 2018). In Scotland, LAC are legally defined in Section 17(6) of the Children (Scotland) Act 1995 and in subsequent legislation in the Adoption and Children (Scotland) Act 2007 and Children's Hearings (Scotland) Act 2011 as children who are:

- "provided with accommodation by a local authority under section 25 of 1995 Act; or
- subject to a compulsory supervision order or an interim compulsory supervision order made by a children's hearing in respect of whom the local authority are the implementation authority (within the meaning of the 2011 Act); or
- living in Scotland and subject to an order in respect of whom a Scottish local authority has responsibilities, as a result of a transfer of an order under regulations made under section 33 of the 1995 Act or section 190 of the 2011 Act; or
- subject to a Permanence Order made after an application by the local authority under section 80 of the 2007 Act."

(Scottish Government, 2016a, pp.6-7)

2.3 Definition of LAC versus CEYP

The terms "Looked after Children" and "Looked After Young People" are commonly used in the UK and usually refer to children and young people currently in care. However, this thesis is concerned with outcomes for those who are or have been in care and therefore uses the broader term of “Care Experienced Young People”. CEYP refers to children and young people who are or have been looked after, regardless of their placement type, duration in care or age.

2.4 Reasons children become looked after

Children can become looked after for various reasons. Most commonly this is due to a lack of parental care, neglect or abuse (Scottish Children’s Reporter Administration, 2014; Scottish Government, 2016a) but children may also become looked after: due to complex disabilities which require specialist care; because they are unaccompanied minors seeking asylum or have been illegally trafficked into the UK; or because of their involvement with the youth justice system (Scottish Government, 2020a; 2021a).

2.5 Compulsory and voluntary routes into care

Most commonly children are looked after via compulsory routes (Scottish Government, 2020c), for example following referral to the Children’s Reporter or via the criminal justice system[3] (Scottish Government, 2021a). However, children can also become looked after voluntarily, for example where parents request for their child to be accommodated by the local authority under a Section 25 voluntary agreement (McRae, 2006; Scottish Government, 2020c).

2.6 Placement types

Children may either be looked after at home (where they continue to live at home under the supervision of a social worker[4]) or looked after and accommodated away from home in:

- kinship care (where they are placed with friends or relatives);
- foster care (where they are placed with an approved foster carer);
- a residential unit or school;

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[3] Following the Kilbrandon Committee recommendations in 1964, Scotland developed the Children’s Hearings System which uses lay tribunals to deliberately integrate child welfare and youth justice processes for young people who commit offences, thus acknowledging that young people who offend may also need care and protection (McRae, 2006; Scottish Children’s Reporter Administration, 2019).

[4] Scotland differs from other parts of the UK in having compulsory measures of supervision which allow children to be looked after by a local authority but remain at home with their families (McGhee, et al., 2018; McRae, 2006). For example, a Children’s Hearing may make a Supervision Requirement or Compulsory Supervision Order which requires the child to be accommodated away from home or at home with their parent(s) (Scottish Children’s Reporter Administration, 2014).

- a secure unit; or
- with prospective adopters (Scottish Government, 2021a).

In 2019/20, approximately 1.4% of children in Scotland were looked after at some point between 1st August 2019 and 31st July 2020 (Scottish Government, 2021a). The proportion of children looked after in Scotland has changed over time, as has the use of different placement types (Figure 2.1). Foster care and kinship care are now the most common placement types, with the proportion of children looked after at home falling during the last decade. The proportion of children in residential care has largely remained stable, and currently accounts for approximately 1 in 10 LAC (Scottish Government, 2021a).

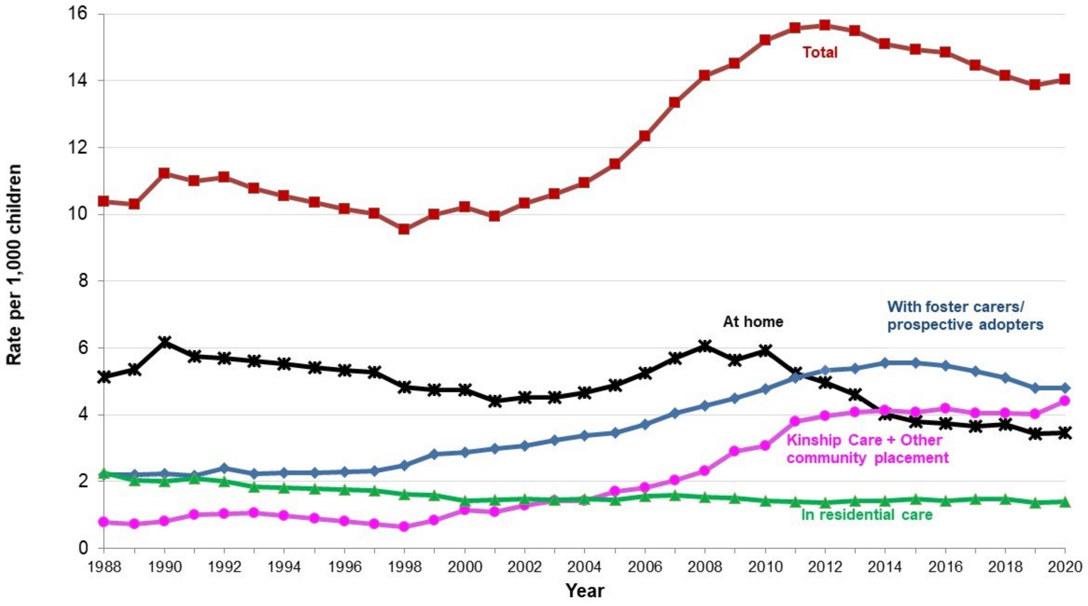

Figure 2.1: Children looked after per 1,000 children under 18 by type of accommodation, Scotland, 1987-2020[5] (Scottish Government, 2021a, p.7)

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[5] The residential care category in Figure 2.1 includes all forms of residential accommodation including local authority homes, voluntary sector homes, residential schools, secure accommodation and other residential accommodation such as crisis care (Scottish Government, 2021a, p.6).

Whilst in care, children may move between different placement types and placement providers (e.g. between different foster carers) although there is now increasing emphasis on minimising the number of placements children experience, to help achieve 'early permanence'[6] (Scottish Government, 2015a).

2.7 'Ageing out' of care and care leaver definition

Some young people remain in care until they 'age out' of the care system at age 16 onwards at which point they may: return home to their biological parents; live with friends, relatives or former foster carers; receive continuing care; move into supported accommodation and semi-independent living; move onto their own tenancy and independent living; become homeless; or move to other settings such as residential care or custody (Scottish Government, 2020c).

Of note, the term "care leaver" can have different meanings depending on the context. For example, it may mean a young person over 16 who has previously been in care (Grauberg, 2019). It can also refer more specifically to those in care aged 16 who then "age out" of care on reaching care leaving age[7].

2.8 Health of CEYP

2.8.1 Overview

CEYP are a heterogenous population with differing health needs and care experiences. Looked after and accommodated young people are thought to share the same health concerns as their non-looked after peers but they may experience these to a greater degree and in a potentially more challenging context (Scott and Hill, 2006, p.30). Less is known about the health of children looked after at home, but there are concerns they may be particularly vulnerable to poorer outcomes (Scott, Hattie and Tannahill, 2013; Scottish Government, 2015a; Welch, et al., 2014). In general, the health of looked after

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[6] Permanence is defined as "providing children with a stable, secure, nurturing relationship and home, where possible within a family setting, that continues into adulthood" (Scottish Government, 2015a, p.18). Routes to permanence include: returning or remaining at home (with ongoing family support if required); via a permanence order (which can be in kinship care, foster care or residential care); via a section 11(1) order or kinship care order; and adoption (Scottish Government, 2015a, pp.18-19).

[7] From April 2015, under the Children and Young People (Scotland) Act 2014, a "care leaver" is legally defined as a young person who ceases to be looked after on or after their 16th birthday (Scottish Government, 2016b, p.11).

children and young people is poorer than their general population peers, particularly for mental health and health related behaviours (Scott and Hill, 2006; Williams, et al., 2001).

2.8.2 Physical health

Data comparing the physical health of CEYP in Scotland with their non-looked after peers is limited (Allik, et al., 2021; Scott, Hattie and Tannahill, 2013). However, the data available suggests that CEYP are more likely to experience physical health problems than their non-looked after peers. Nonetheless, the general health of the majority of LAC is still reported to be good or very good (Meltzer, et al., 2004; Scott and Hill, 2006).

High levels of physical health problems such as obesity, vision problems and hearing problems have been reported among LAC but comparative data is often limited (Scott, Hattie and Tannahill, 2013) and background factors such as socioeconomic deprivation are likely to be important (Scott and Hill, 2006). For example, in a large cross-sectional study of a random sample of 5-15 year olds in England, Scotland and Wales, significantly higher levels of epilepsy, cystic fibrosis and cerebral palsy were reported among LAC compared with the general population, but only cerebral palsy was more common among LAC when compared with the most deprived socioeconomic group in the general population (Martin, et al., 2014). The same study found no difference in reported levels of glue ear, diabetes mellitus, spina bifida or cancer but lower levels of asthma, eczema and hay fever among LAC compared with the general population, raising the possibility of underdiagnosis and underreporting of some physical health conditions among LAC.

LAC may have greater difficulty accessing routine health care compared with their general population peers and are less likely to be up to date with their childhood immunisations than the general population (Walton and Bedford, 2017). LAC also have poorer dental health than their general population peers (Williams, et al., 2001), even once socioeconomic deprivation has been accounted for (McMahon, et al., 2018), but are less likely to attend a dentist regularly (McMahon, et al., 2018).

2.8.3 Mental health

While individual needs vary, there is good evidence that, in general, LAC have poorer mental health than the general population (Meltzer, et al., 2004), even after adjusting for socioeconomic disadvantage (Ford, et al., 2007; Scott, Hattie and Tannahill, 2013). For example, in a large, nationally representative survey of psychiatric disorder among LAC in Scotland, England and Wales, 46% of LAC aged 5-15 had at least one ICD-10 psychiatric diagnosis compared with 15% of disadvantaged and 9% of non-disadvantaged children living in private households (Ford, et al., 2007). Prevalence varied by placement type, ranging from 32% among LAC aged 5-17 in kinship care to 71% among those in residential care (Ford, et al., 2007). If a broader definition of mental health problems is used the occurrence of mental health problems among LAC is even higher, with 72% of LAC aged 5-15 in an English study by Sempik, Ward and Darker (2008) showing behavioural or emotional problems of concern to carers. CEYP also have higher levels of risk factors for self-harm and suicide (Furnivall, 2013).

Separating out the effect of pre-care experiences and the impact of the care system on the mental health of LAC can be difficult however (Baldwin, et al., 2019; Scott, Hattie and Tannahill, 2013). LAC are known to have poorer mental health prior to entering care (Dimigen, et al., 1999; Sempik, Ward and Darker, 2008). The experience of being in care may then potentially improve mental health or may contribute to a deterioration, due to placement moves and disrupted relationships, for example (Priestley and Kennedy, 2015; Sanders, 2020).

Accessing appropriate support to help LAC address mental health difficulties can be difficult, however, due to barriers such as late identification, waiting times for services, the complexity of problems experienced and stigma (Priestley and Kennedy, 2015). There are concerns that children looked after at home in particular may not receive the support and services they require, despite having similar levels of mental health difficulties as their looked after and accommodated peers (Meltzer, et al., 2004; Scott and Hill, 2006).

2.8.4 Health related behaviours

LAYP are more likely to have adverse health related behaviours than their general population peers (Priestley and Kennedy, 2015), although comparison with similarly socioeconomically deprived young people is limited (Scott, Hattie and Tannahill, 2013). For example, LAYP have higher rates of smoking (Meltzer, et al., 2004; Williams, et al., 2001), alcohol consumption (Meltzer, et al., 2004) and illegal drug use (Meltzer, et al., 2004; Williams, et al., 2001) than their general population peers. LAYP may also be more likely to engage in risky sexual behaviour such as sexual intercourse at a younger age and unprotected intercourse (Priestley and Kennedy, 2015; Roberts, et al., 2018) and are at increased risk of child sexual exploitation (Lerpiniere, et al., 2013).

2.8.5 Adulthood health

Poorer health among CEYP may persist into adulthood. CEYP are more likely to experience psychological morbidity and report poorer health in adulthood compared with their non-care experienced peers, even after adjusting for socioeconomic factors (Murray, et al., 2020; Viner and Taylor, 2005). This may reflect the role of adverse childhood experiences (ACEs) on later health. Exposure to multiple ACEs is associated with a wide range of poorer health outcomes in adulthood (Hughes, et al., 2017). Poorer health among CEYP in later life may therefore reflect their greater exposure to ACEs in earlier life (Simkiss, 2019).

2.9 Challenges facing care leavers

Care leavers face the same challenges as many young people when making the transition to independent, adult life such as gaining qualifications, finding employment, managing finances and establishing a home. However, care leavers often have to make this transition at a younger age and in more difficult circumstances than their non-care experienced peers (Stein, 2006a). For example, the average age nationally for young people leaving home is now around 25 years (Duncalf, Hill and McGhee, 2013). In contrast, the average age for young people leaving care in Scotland is only 16-18 years. Consequently, care leavers often experience a much more “accelerated and compressed” transition to adulthood than their non-care experienced peers (Stein, 2006a, p.274), despite potentially having fewer resources and less support available to meet the challenges.

Care leavers' experiences vary considerably though. Some very successfully 'move on' from care. For others ageing out of care can be a difficult time (Stein, 2006a) with those entering care late, those experiencing placement instability, those entering care because of behavioural problems and those without a close, stable, caring relationship being particularly at risk of poorer outcomes (Centre for Social Justice, 2014; Stein, 2006a).

In general, care leavers are more likely to have: fewer educational qualifications (Scottish Government, 2021c); poorer access to continuing education and training (McGhee, et al., 2014); higher levels of unemployment (McGhee, et al., 2014); greater housing instability (CELCIS, 2015; 2019); higher levels of homelessness (CELCIS, 2019; McGhee, et al., 2014); poorer mental health (McGhee, et al., 2014); and greater difficulty forming new relationships (Centre for Social Justice, 2014) than their non-care experienced peers. While most of those ageing out of care do not return to live with family members, most do keep in touch with family members (Wade, 2008). The support available from families, however, varies and may not be reliable (Wade, 2008) and some care leavers experience considerable social isolation and loneliness (Centre for Social Justice, 2014).

The need to provide care leavers in Scotland with greater support, over a longer period of time, to improve outcomes is increasingly recognised (McGhee, et al., 2014, p.12). For example, the care leaving age in Scotland has recently been extended to allow young people who are looked after in foster, kinship or residential care to remain in their care placement until age 21, with aftercare support extended until age 26[8]. Local authorities and their corporate parenting partners have also been encouraged to provide

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[8] The Children and Young People (Scotland) Act 2014 introduced the legal term "Continuing Care" which, from April 2015, allows a young person born after 1 April 1999 who is looked after away from home to continue to receive the same assistance and remain in their current care placement up to their 21st birthday, thereby providing a more gradual transition from care (CELCIS, 2014b; Scottish Government, 2016c). To be eligible for Continuing Care, the young person must first cease to be looked after but their day-to-day experience is expected to remain similar to when they were looked after (CELCIS, 2014b; Scottish Government, 2016a). When Continuing Care ends the young person is then eligible for Aftercare support until their 26th birthday (CELCIS, 2014b; Scottish Government, 2016a). Local authorities may, but are not legally required to, provide Aftercare support to care leavers beyond age 26 (CELCIS, 2014b).

care leavers with a ‘safety net’ by giving care leavers the option to leave care and return if difficulties arise (Scottish Government, 2013a; 2013c), thereby more closely mirroring the experience of other young people who are able to return home as needed for help and support (Centre for Social Justice, 2014; Scottish Government, 2013c). However, while these policy changes aim to increase the support available for care leavers, in practice their implementation may be limited by resource constraints (McGhee, et al., 2014; McGhee, 2017).

In the context of the challenges described above, becoming a young parent can be a particularly challenging time for CEYP, as the rest of this chapter describes.

2.10 Teenage pregnancy in the UK

2.10.1 UK teenage pregnancy trends

The UK has one of the highest teenage birth rates in Western Europe (World Health Organization, 2018). Reducing teenage pregnancy has been a key UK policy issue (Hadley, Ingham and Chandra-Mouli, 2016; Scottish Executive, 2005; Scottish Government, 2011; 2016d) and teenage pregnancy rates in the UK have fallen considerably in recent years (Public Health Scotland, 2020a). However, there are concerns that LAYP may not have benefitted from the recent decline in UK teenage pregnancy rates (Mezey, et al., 2017).

2.10.2 Negative outcomes associated with teenage pregnancy

Teenage pregnancy can be a very positive experience for many young people. However, it is also associated with a range of short and long-term negative outcomes for both mother and baby (Scottish Government, 2016d; Swann, et al., 2003). For example, teenage mothers are more likely to: engage later with services during pregnancy (thereby missing out on potentially beneficial early antenatal care); smoke during pregnancy; have poorer mental health; experience mental health issues including postnatal depression; experience higher levels of isolation and low self-esteem; have fewer qualifications; and be unemployed or if employed have a lower income (Scottish Government, 2016d; Swann, et al., 2003). The children of teenage mothers: are more likely to have a low birth weight; are less likely to be breastfed; and have a higher infant mortality (Scottish Government, 2016d; Swann, et al., 2003). The daughters of teenage mothers are more likely to become teenage mothers themselves (Swann, et al., 2003), with the cycle of teenage pregnancy and its associated socioeconomic disadvantage potentially then passing onto the next generation (Scottish Government, 2016d).

However, these adverse outcomes are not universal (Swann, et al., 2003) and association does not imply causation. It is notable that many of the adverse outcomes associated with (but not necessarily caused by) teenage pregnancy are related to potentially amenable socioeconomic disadvantage. For example, the educational, employment and income related adverse outcomes experienced by young parents may be due to pre-pregnancy social disadvantage, which then continues post-pregnancy, rather than to early maternal age itself (Duncan, 2007).

2.10.3 The 'problematisation' of teenage pregnancy in the UK

There has been much debate about the 'problematisation' of teenage pregnancy in the UK. This includes criticism of the negative framing of teenage pregnancy in UK policy where teenage pregnancy is portrayed as a 'social threat' (Duncan, 2007) and a social or public health 'problem' (Arai, 2009). It is argued that too much emphasis has been placed on the negative outcomes associated with teenage pregnancy with insufficient recognition of the positive aspects of teenage parenthood (Aria, 2009; Duncan, 2007) and the value of the role of parenthood (Duncan, 2007). Given that the negative outcomes associated with teenage pregnancy are largely related to social disadvantage, it can instead be argued that the real problem is social disadvantage, rather than early maternal age itself. As such, care is needed around how 'the problem' of teenage pregnancy is framed, to avoid stigmatising young people (CELCIS, 2013). This is particularly important for CEYP who may already face negative framing of a wide range of issues relating to care experience (O'Neil, Pineau and Hyatt, 2020).

This does not mean, however, that the issue should be ignored. Indeed, this thesis argues that teenage pregnancy among CEYP is an important issue for corporate parents to consider, as CEYP may find it harder to prevent an unplanned teenage pregnancy and may experience higher rates of teenage pregnancy than their non-care experienced peers. They may also face additional challenges as young parents and be more susceptible to the adverse outcomes and socioeconomic disadvantage associated with teenage pregnancy. National policy recognises that all young people should be empowered to prevent unwanted pregnancy, be supported to make an informed choice if they become pregnant and be supported if they become young parents (Scottish Government, 2016d). Corporate parents have a key role to play in supporting CEYP, just as any good parent would, to ensure that all CEYP, including those who are pregnant or young parents, thrive. To support CEYP appropriately though corporate parents need to understand the needs of CEYP in relation to teenage pregnancy, including how these needs may differ from non-care experienced young people (non-CEYP) and the rate of teenage pregnancy among CEYP. These are both discussed in the rest of this chapter.

2.11 CEYP experiences of teenage pregnancy

2.11.1 Overview

CEYP face the same issues as many young people in relation to preventing teenage pregnancy, considering their options once pregnant and becoming young parents. However, CEYP may also face additional challenges or experience some issues differently, depending on their particular circumstances. This section discusses some of the issues CEYP may face in relation to teenage pregnancy and early parenthood including: why preventing teenage pregnancy may be more difficult for CEYP; how previous experiences may influence their pregnancy decisions; why CEYP may need extra support as young parents; and the potential challenges for professionals in providing support.

2.11.2 CEYP may find it harder to prevent an unplanned teenage pregnancy

Being care experienced is often cited as a risk factor for teenage pregnancy (Public Health England, 2018; Swann, et al., 2003) but the lives of CEYP can be complex and care experience may be just one of several risk factors CEYP experience. Notably, while care experience may be associated with an increased risk of teenage pregnancy, this does not necessarily mean that being in care causes teenage pregnancy. Care experience may instead just be a marker of other risk factors.

In a systematic review of European Union countries, Imamura et al. (2007) identified the following factors as being associated with teenage conception among young people generally:

- *Sociodemographic*: lower socioeconomic status.
- *Family structure*: family disruption (e.g. not living with both parents) and having a mother who had a teenage conception.
- *Educational*: leaving school early (i.e. at minimum school leaving age), dislike of school and a lack of expectation of being in higher education at age 20.
- *Sexual health knowledge, attitudes and behaviour*: early age (under 16) at sexual initiation, increasing number of partners, non-use of contraceptives and an expectation of parenting by age 20.

Other risk factors include: truancy (Allen, et al., 2007); alcohol use (Allen, et al., 2007); peer norms such as believing that the majority of one's peers are sexually active (Allen, et al., 2007); sexual abuse (Madigan, et al., 2014; Noll, Shenk and Putnam, 2009); physical abuse (Madigan, et al., 2014); and experiencing multiple ACEs (Hughes, et al., 2017). Potentially protective factors include easy communication between a girl and her mother or female guardian and gaining information about sex from school (Allen, et al., 2007).

While individual circumstances vary, CEYP in general are more likely than their non-care experienced peers to experience risk factors for teenage pregnancy (Mezey, et al., 2017). For example, in their review Imamura et al. (2007, p.634) concluded that "Socioeconomic disadvantage, disrupted family structure and limited education appear to be most consistently related to teenage pregnancy". CEYP are more likely to experience all three of these key risk factors (Mezey, et al., 2017). CEYP may also:

- Miss school-based sex and relationships education (Billings, Hashem and Macvarish, 2007; Datta, et al., 2017; Lyons, et al., 2016) due to lower school attendance, higher school exclusion rates and disrupted schooling (CELCIS, 2013; Chase, et al., 2006).

- Experience disrupted friendships and social networks (Billings, Hashem and Macvarish, 2007) and find it harder to build good relationships with partners, due to frequent placement moves (Lyons, et al., 2016).
- Lack a close, trusted adult to confide in (Haydon, 2003) and find it difficult to discuss sexual health and relationship issues with foster carers and residential care staff (Dale, et al., 2010), due to feeling judged for example (Chase, et al., 2006; Knight, Chase and Aggleton, 2006).
- Engage in risk taking behaviours including becoming sexually active at a younger age, particularly in residential care settings, due to low self-esteem (Knight, Chase and Aggleton, 2006), peer pressure (Chase, et al., 2006; Corlyon and McGuire, 1999; Knight, Chase and Aggleton, 2006) and a lack of supervision (Corlyon and McGuire, 1999).
- Be more likely to have learning difficulties, which may make it harder to negotiate safe sexual relationships (Chase, et al., 2006; Mezey, et al., 2017).
- Be reluctant to use sexual health services due to a fear of being judged and concerns about confidentiality, while placement moves may make accessing regular contraception difficult (Chase, et al., 2006).

As a result, CEYP may find it more difficult than their non-care experienced peers to prevent an unplanned teenage pregnancy.

2.11.3 CEYP's previous experiences may influence their pregnancy decisions

Not all teenage pregnancies are unplanned (Cater and Coleman, 2006; Macutkiewicz and MacBeth, 2017). For example, in an English study of care leavers, over one third of young parents said their pregnancies had been planned, with starting a family helping some care leavers avoid the "threat of loneliness" that the move to independent living can bring (Biehal, et al., 1995, p.132). Similarly, not all unplanned pregnancies are unwanted. There is evidence to suggest that, if pregnant, CEYP may be more likely than their general population peers to continue with the pregnancy, even where the pregnancy is unplanned, with CEYP's previous experiences influencing their decision. CEYP may receive little support to help them make their pregnancy decision (Chase, et al., 2006).

In a Welsh national audit by Craine et al. (2014) pregnant LAC aged 14-17 were significantly more likely to continue a pregnancy through to a live birth than their non-LAC peers (70% versus 28% respectively, $p<0.001$). However, part of the difference observed may have been due to socioeconomic differences between LAC and non-LAC in the audit. LAC experience greater socioeconomic deprivation than the general population (Bywaters, et al., 2020; Scott, Hattie and Tannahill, 2013). Pregnancy outcomes among young people are known to vary considerably by socioeconomic group, with more deprived groups being more likely to progress a pregnancy to delivery than more affluent groups (Office for National Statistics, 2020; Public Health Scotland, 2021a). The audit results did not take socioeconomic deprivation into account however, so it is not known whether LAC were more likely to continue with a pregnancy to delivery than their non-looked after but similarly deprived peers.

Qualitative research suggests that the previous experiences of CEYP may influence their decision to continue with a pregnancy. For example, a qualitative study of care experienced teenage parents in England found that, while most pregnancies were unplanned, the pregnancy was often quickly accepted by the young person, with many describing previous "feelings of abandonment and lack of attachments" as the rationale behind accepting and continuing with the pregnancy (Chase, et al., 2006, p.442). The "need to love and care for someone" (Knight, Chase and Aggleton, 2006, p.399) was often cited as a reason for wanting to continue with the pregnancy and having a baby was thought to offer "security, purpose, focus and identity" (p.400) as the following quote illustrates:

> "With my first child, it's like having someone of your own to love as I'd never had that, and especially if you've been on your own a lot like me. I think that's why I was so over the moon when I got pregnant. It's almost like you have given yourself a purpose, some security…" (Knight, Chase and Aggleton, 2006, p.400).

The desire to continue with a pregnancy to help fill "an emotional void" was also identified in a meta-synthesis of qualitative research by Connolly, Heifetz and Bohr

(2012, p.622) where some CEYP saw having a child as “a way to create what they believe will be an enduring relationship and a family, at last.” (Connolly, Heifetz and Bohr, 2012 p.622), with motherhood offering “an opportunity for healing and renewal” (Pryce and Samuels, 2010, p.223). Parenthood can also provide status, enjoyment and a sense of achievement (Chase, et al., 2006).

Early parenthood may also be welcomed by CEYP for other reasons. For example, for those who are unhappy at school, it may provide the opportunity to abandon school (Connolly, Heifetz and Bohr, 2012). For others, it may act as a welcome turning point to make a positive life change (Barn and Mantovani, 2007) such as stopping drug-misuse (Chase, et al., 2006; Rolfe, 2008) or involvement in crime (Rolfe, 2008), with motherhood being welcomed by the young person as a positive, stabilising influence on their lives (Connolly, Heifetz and Bohr, 2012).

There are therefore several reasons why CEYP may be more likely to continue with a teenage pregnancy, compared with their general population peers. However, the reasons cited above are not unique to CEYP (Knight, Chase and Aggleton, 2006) and similar influences on teenage pregnancy decision making have been identified in qualitative research among other socially disadvantaged young people (Harden, et al., 2009; Lee, et al., 2004). It is therefore not currently known whether CEYP in the UK are more likely than their similarly socioeconomically deprived but non-care experienced peers to continue with a pregnancy.

2.11.4 CEYP may experience poorer perinatal outcomes

Data is limited but CEYP may be more likely to experience poorer perinatal outcomes than their non-care experienced peers. For example, in the UK Millennium Cohort Study mothers who reported spending time in care as a child were significantly more likely to smoke during pregnancy and have symptoms of depression, even after adjusting for confounding factors such as maternal age, income, education and social class (Botchway, Quigley and Gray, 2014). Mothers with a care history were also more likely to have a low-birthweight baby and less likely to breastfeed although neither of these were statistically significant once adjusted for potential confounding factors. A

US study by Bublitz et al. (2014) has also suggested that a maternal history of adoption or foster care may be a risk factor for preterm birth, possibly due to the effects of adverse stress during childhood. Similarly, a Swedish study by Liu et al. (2018) recently found that women with a history of out of home care had an increased risk of preterm delivery. Of note, these studies considered mothers of various ages (not specifically teenage mothers). However, they suggest that CEYP may have greater perinatal health needs.

2.11.5 CEYP may need extra support as young parents but be less likely to receive it

Teenage parenthood and care experience are both associated with social disadvantage and this disadvantage may be compounded for CEYP who are also young parents (Knight, Chase and Aggleton, 2006). As such, care experienced young parents may be at even greater risk of social exclusion (Stein, 2006b) with the potential for experiencing the negative outcomes associated with both early parenthood and care experience being described as ‘double jeopardy’ by Felix et al. (2003).

CEYP will face the same challenges as other teenage parents but may also face additional challenges. Individual needs will depend on individual circumstances. The needs of very young teenage parents and those still in care while parenting may differ from older teens who have left care, for example. Parenting may be particularly challenging for care leavers, as parenthood may be just one of several challenges they face on leaving care (as described in Section 2.9).

While parenting can be a positive, enjoyable and rewarding experience for CEYP, they may also experience: social isolation (Datta, et al., 2017; Mendes, 2009); financial insecurity and hardship (Datta, et al., 2017; Rolfe, 2008); lack of budgeting and housekeeping skills (Datta, et al., 2017); unsuitable accommodation (Roberts, Maxwell and Elliott, 2019) and unsettled living arrangements (Datta, et al., 2017); poor mental health (Connolly, Heifetz and Bohr, 2012); and competing priorities or loss of other roles such as school, college or work (Datta, et al., 2017; Maxwell, Proctor and Hammond, 2011; Pryce and Samuels, 2010).

While many CEYP parent very successfully, parenting may be more difficult for some due to a lack of positive parental role models (Datta, et al., 2017). Qualitative research consistently shows that CEYP want to parent well with a desire to be a 'good parent' (Maxwell, Proctor and Hammond, 2011) and "to be a better parent to their own child than their birth parents had been to them" (Connolly, Heifetz and Bohr, 2012, p.627). However, while some CEYP describe their own experience of being parented as providing them with "a model of how not to parent" (Pryce and Samuels, 2010, p.217), a lack of positive parental role models may mean some CEYP do not know how to meet their babies' physical and developmental needs (Datta, et al., 2017) and may inadvertently repeat the poor parenting patterns they are so keen to avoid (Pryce and Samuels, 2010).

While research often focuses on the needs of young mothers, care experienced young fathers have described significant barriers to being actively involved in the care of their children such as: no longer being in a relationship with the child's mother; the child's mother having a new partner or moving away; having their involvement discouraged by social workers; financial difficulties; unemployment; lack of family friendly accommodation; being in prison; and drug misuse (Chase, et al., 2006; Tyrer, et al., 2005).

Importantly, although care experienced young parents may need extra support, they may be less likely to receive it. For example, support from partners can vary from very supportive relationships to violent or difficult relationships which make coping even more difficult (Chase, et al., 2006; Reeves, 2003). Developing and maintaining relationships with friends, family and wider support networks may be difficult, due to placement moves or moving areas and difficulties developing trusting relationships (Knight, Chase and Aggleton, 2006). Family support can also be variable (Chase, et al.,2006). For some, the birth of a child may improve their relationship with their family (Reeves, 2003). For others, family relationships remain poor (Reeves, 2003) and, for some, reaching out for support only leads to further rejection (Chase, et al., 2006; Maxwell, Proctor, and Hammond, 2011). Those with little or no informal support may be more reliant on more formal support from services. However, access to such services may be limited. For example, support may be limited to office hours (Roberts, Maxwell and Elliott, 2019) or service provision may be limited by resource constraints (Datta, et al., 2017). As such, services will often not be able to replicate the informal support that other, well-supported young parents receive (Roberts, Maxwell and Elliott, 2019).

Despite having greater needs, care experienced young parents may be reluctant to ask professionals for help. For example, in a study of care experienced young parents in England, few young mothers with postnatal depression asked for help (Chase, et al., 2006). Those who did often felt they were not listened to or that their feelings were quickly dismissed. The qualitative literature also repeatedly describes a mistrust of social workers among CEYP (Chase, et al., 2006; Connolly, Heifetz and Bohr, 2012; Reeves, 2003) due to previous experiences (Datta, et al., 2017; Roberts, 2017) and the perceived (and potentially real) risk that their children may be taken into care if they are perceived not to be coping (Connolly, Heifetz and Bohr, 2012; Datta, et al., 2017). Care experienced young parents may be concerned that seeking help will be viewed by professionals as “admitting failure as a parent” (Datta, et al., 2017, p.467) and those with emotional or mental health problems in particular may be less likely to seek support (Datta, et al., 2017). Care experienced young parents describe feeling ‘pre-judged’ (Connolly, Heifetz and Bohr, 2012) and scrutinised more than other young parents (Chase, et al., 2006), with some feeling that social care professionals’ awareness of their care history is used against them in child protection assessments (Connolly, Heifetz and Bohr, 2012; Roberts, 2017). Social service involvement may therefore be perceived as “intrusive” (Maxwell, Proctor and Hammond, 2011, p.36) or “punitive” (Roberts, 2017, p.8) rather than supportive, with ambiguity over whether the social worker is there to support them as a parent or to monitor the baby (Connolly, Heifetz and Bohr, 2012; Reeves, 2003). Social care professionals also describe the challenge of their “dual responsibilities and divided loyalties” (Roberts, Maxwell and Elliott, 2019, p.5) when trying to both support young parents and potentially protect their children.

2.11.6 Intergenerational transmission of care

It is important not to stigmatise care experienced young parents by overemphasising negative parenting outcomes. Many CEYP parent very successfully despite the challenges they face (Biehal, et al., 1995; Datta, et al., 2017; Roberts, Maxwell and Elliott, 2019), particularly if they receive suitable personal and financial support (Mendes, 2009). However, despite the desire of many CEYP to parent well, there is increasing evidence that children born to care experienced young parents are more likely to receive a care intervention themselves (Roberts, Maxwell and Elliott, 2019). For example, Freedom of Information data from English local authorities in 2014 found that at least one in ten care leavers aged 16-21 who were parents had a child taken into care in the previous year (Centre for Social Justice, 2015). Similarly, in a Welsh study of young parents receiving statutory support while in or leaving care, 26% of children were separated from their parents, with 10% in local authority care, 9% with adoptive carers and 7% living with family and friends (Roberts, Maxwell and Elliott, 2019). Care experienced mothers are also overrepresented among birth mothers subject to recurrent care proceedings in England (Broadhurst, et al., 2017) whilst care leavers in Wales are overrepresented among birth parents whose children are placed for adoption (Roberts, et al., 2017). This intergenerational transfer of care has led for calls to improve outcomes for care experienced young parents (Roberts, et al., 2017) and for the State to consider its role as a 'corporate grandparent' as well parent (Centre for Social Justice, 2015; Roberts, 2017).

2.11.7 Positive framing of CEYP teenage pregnancy related needs

Interestingly, although the needs of CEYP in relation to teenage pregnancy are often described as challenges, many of the issues can also be viewed as opportunities for corporate parents to improve outcomes for CEYP. For example, many aspects of providing good quality care generally, such as promoting stable placements, developing high quality relationships between CEYP and carers, developing supportive social networks and improving school engagement, may mitigate some of the risk factors for teenage pregnancy described in Section 2.11.2, as well as providing broader benefits for CEYP. Similarly, pregnancy and parenthood offer opportunities for maternity and early years services to support and build trust with young parents (Botchway, Quigley and

Gray, 2014; Datta, et al., 2017) which could help pave the way for more positive relationships with other professionals and services in later life. The motivation of CEYP to parent well also provides an opportunity to develop new relationships between CEYP and social care and other professionals by offering support in ways which are more acceptable to CEYP. For example, by clarifying the role of the social worker in supporting versus monitoring a family (Connolly, Heifetz and Bohr, 2012) and by offering support through alternative services, such as specialist leaving care services and the voluntary sector, who may find it easier to build positive relationships with CEYP (Centre for Social Justice, 2015; Chase, et al., 2006). Parents' motivation to provide for their children can also be used to help support young people to stay in or return to education in later life (Connolly, Heifetz and Bohr, 2012). There is therefore much that corporate parents can potentially do to both support CEYP in preventing unintended teenage pregnancy and to support those who are young parents. However, in order to understand the teenage pregnancy related needs of CEYP, corporate parents also need to understand teenage pregnancy rates among CEYP in their area.

2.12 Teenage pregnancy rates among CEYP

2.12.1 Overview

Despite its importance, surprisingly little is known about teenage pregnancy rates among CEYP in Scotland. Data on teenage pregnancy rates among CEYP in Scotland is not routinely collected at a health board, local authority or national level. While data on teenage pregnancy among the general population is routinely collected at a health board and national level it does not currently include whether the young person concerned is, or has been, looked after. Knowledge of the teenage pregnancy rate among CEYP in Scotland therefore relies instead on national data from elsewhere in the UK, from UK or international studies or on tacit knowledge.

2.12.2 National routinely collected data in the UK

Neither Scotland nor Wales routinely collect data on teenage pregnancy among CEYP (CELCIS, 2013; Roberts, et al., 2018). Limited national data is, however, available from England and Northern Ireland:

- Local authorities in England record the motherhood status of girls who are currently looked after (Department for Education, 2021). This covers live births occurring whilst the girl is in care but not terminations of pregnancy or births occurring once the girl has ceased to be looked after. In 2018/19, 2% of looked after females aged 12 and over in England were mothers (Department for Education, 2019).
- Local authorities in England also collect data on the main educational, training or employment activity, where known, of care leavers (Department for Education, 2021). In 2018/19, 6% of care leavers (male and female) aged 19-21 in England were not in education, training or employment due to pregnancy or parenting[9] (Department for Education, 2019). While this figure does not cover all care leavers who are pregnant or parents (as some will be in education, training or employment) it at least provides some information on how care leavers in England fare shortly after leaving care.
- In Northern Ireland, data is collected on care leavers aged 19 who have dependants. In 2019/20, 10% of care leavers (male and female) aged 19 were parents (Information Analysis Directorate, 2021). Approximately half (52%) of those with dependants were in education, training or employment (Information Analysis Directorate, 2021). Among female care leavers, 13% became mothers on or before their 19th birthday, compared with only 1% of 15-19 year old females in the general population who became mothers (Information Analysis Directorate, 2021). Whilst these figures are not directly comparable, they suggest that female care leavers are more likely than the general population to become teenage mothers.

2.12.3 UK studies

Scottish study data on teenage pregnancy among CEYP is sparse:

- In a health care needs assessment of LAYP aged 12-17 in residential care in Lothian in 2000, 9% of girls were known to be or to have been pregnant (The

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[9] The Department for Education data defines care leavers as "All children who had been looked after for at least 13 weeks which began after they reached the age of 14 and ended after they reached the age of 16" (Department for Education, 2019).

Residential Care Health Project, 2004). However, this figure was based on a small sample of only 44 females.

- In a survey of young people (male and female) aged 15½-19 years from three local authorities in Scotland who had left care in 2000/01, 14% had a child and 7% were either pregnant or had a pregnant partner within 5 to 24 months of leaving care (Dixon and Stein, 2002). However, the study was again small and the response rate low, with data available for only 88 of the 212 (42%) young people invited to participate.
- In a recently published study of health outcomes and service use for care experienced children in Scotland, 7.1% of care experienced females aged 11-26 years had experienced an abortion compared with only 3.8% of their general population peers (Allik, et al., 2021). The study by Allik et al. is a large, robust, nationally representative, longitudinal study which represents a considerable improvement in the health outcome data available for CEYP in Scotland. However, data on teenage births is not yet available and the abortion data published so far does not adjust for factors such as socioeconomic status.

Elsewhere in the UK, the most reliable indicator of teenage pregnancy levels among CEYP comes from a national audit in Wales in 2012/13 (Craine, et al., 2014). The audit aimed to collect data on all women under 18 years presenting as pregnant to health services. Among young women aged 14-17, 5% of current LAC were pregnant compared with only 0.8% of those who were not looked after ($p<0.001$). Among women aged 17, approximately 1 in 8 (12%) of current LAC were pregnant, compared with only 1 in 69 (1.4%) of non-LAC. LAC were also significantly more likely to continue a pregnancy through to a live birth than non-LAC (70% versus 28%, $p<0.001$). Whilst the audit is the best currently available evidence of teenage pregnancy levels among LAC in the UK it has several important limitations: the audit response rate was only 43% with potential underestimation of pregnancies among LAC; it considered only current LAC; and it did not account for socioeconomic status.

More recently, research by the Centre for Social Justice, based on Freedom of Information requests to English local authorities in 2014, found that approximately 1 in

5 (22%) of female care leavers became teenage mothers (Centre for Social Justice, 2015). Whilst not directly comparable with national statistics, this was estimated to be around three times higher than the general population figure of 8% for England and Wales. In some local authority areas, over half of female care leavers were reported to be teenage mothers. Interpretation of the data is limited by the lack of a detailed published methodology (for example, the quality of the Freedom of Information data collected is not known) but it does suggest a high level of teenage motherhood among care leavers. Taken alongside the Welsh audit data from Craine et al. (2014) it suggests that both current LAC and care leavers in the UK may experience high levels of teenage pregnancy.

Although now dated, and lacking general population comparators, high levels of teenage parenthood among care leavers have also been reported in several, older English studies:

- In a study of 65 females who left care aged 16-18 from three English local authorities in 1986/87, one in seven (14%) were pregnant or already had a child by the time they were discharged from care (Garnett, 1992).
- In a study of 183 young people leaving care aged 16-19 from three English local authorities in 1990, 1 in 8 (13%) already had children by the time they moved to independence or legally left care, and almost a quarter (23%) of female care leavers were already mothers (Biehal, et al., 1992). In a smaller, follow-on study, within 18-24 months of leaving care one third (32%) of all care leavers were parents and nearly half (47%) of female care leavers were mothers (Biehal, et al.,1995).
- In a larger study of 261 care leavers aged 16-21 from six English local authorities, a quarter (25%) were parents (Barn, Andrew and Mantovani, 2005). Among female care leavers, 35% were or had been teenage mothers (Barn and Mantovani, 2007).
- Similarly, in a study of 106 young people aged 16-18 leaving care from seven English local authorities, a quarter (26%) were parents or were expecting a child 12-15 months after leaving care (Wade, 2008). For females, the figure was 35% compared with 15% for males.

While most UK studies to date have focused on current LAYP or care leavers, limited data on teenage pregnancy among CEYP more generally is available from the following longitudinal cohort studies:

- Among mothers participating in the UK Millennium Cohort Study, those who reported spending time in care as a child were twice as likely to report a teenage birth compared with those who did not report spending time in care (Botchway, Quigley and Gray, 2014).
- Similarly, in the Avon Longitudinal Study of Parents and Children, mothers who reported being looked after as a child were more likely to have been pregnant before age 17, compared with those who were adopted and those who were neither looked after nor adopted (22% versus 8% versus 6% respectively) (Teyhan, Wijedasa and Macleod, 2018).
- In contrast, in the 1970 British Birth Cohort Study, which follows infants from across the UK born in 1970 through into adulthood, no difference was found in self-reported pregnancy aged 18 or younger between women with a history of care and those without (Viner and Taylor, 2005). However, those with a history of care were more likely to be lost to follow-up which may have introduced ascertainment bias.

Taken as a whole, existing UK studies suggest that current LAYP experience higher levels of teenage pregnancy than their non-looked after peers and that care leavers experience high levels of teenage parenthood. However, the UK studies identified above are either now dated or limited by factors such as: small sample sizes; low response rates; reliance on survey data where those participating may not represent the wider care experienced population; and lack of a non-care experienced comparator or, where a general population comparator is available, lack of accounting for the effect of socioeconomic deprivation on the teenage pregnancy rates observed. This last limitation is particularly important as being looked after (Bywaters, et al., 2020; Scott, Hattie and Tannahill, 2013) and teenage pregnancy (Office for National Statistics, 2020; Public Health Scotland, 2021a) are both associated with socioeconomic deprivation. The high levels of teenage pregnancy observed among CEYP may therefore merely reflect socioeconomic differences between CEYP and their non-care experienced peers. From a corporate parenting perspective, both the absolute and relative rates of teenage pregnancy among CEYP are important. However, neither of these are currently known for CEYP in Scotland and, given its limitations, cannot be reliably deduced from the wider UK data.

2.12.4 International studies

International literature from the United States (Eastman, Palmer and Ahn, 2019; Svoboda, et al., 2012; Winter, Brandon-Friedman and Ely, 2016); Canada (Tweddle, 2007); Sweden (Brännström, Vinnerljung and Hjern, 2016; Vinnerljung, Franzén and Danielsson, 2007); and Australia (Mendes, 2009) have all found high rates of teenage pregnancy or early parenthood among CEYP. The prevalence of teenage pregnancy among CEYP in other countries cannot be generalised to the UK, due to differences in both national teenage pregnancy rates and child welfare systems between countries. However, the overall pattern of risk seen in other countries may help indicate the likely risk of teenage pregnancy among CEYP in the UK. For example, observing a higher risk of teenage pregnancy among CEYP across several countries which have different national teenage pregnancy rates and varying child welfare systems would add weight to the suggestion that CEYP in the UK are also likely to be at higher risk of teenage pregnancy. The comparison of the frequency of teenage pregnancy among CEYP versus non-CEYP in the UK and other very high Human Development Index (HDI) countries forms the basis for the systematic review described in Chapter 3.

2.13 Conclusion

Teenage pregnancy is an important issue for CEYP. CEYP may find it more difficult than their non-care experienced peers to prevent an unplanned pregnancy. CEYP may also face additional challenges as young parents and require extra support but be less likely to receive it. Corporate parents have a key role to play in supporting CEYP in preventing unintended teenage pregnancy and in supporting care experienced young parents. However, despite its importance, little is known about teenage pregnancy rates among CEYP in Scotland. Data from elsewhere in the UK suggests that current LAYP are more likely to experience teenage pregnancy than non-LAYP and that care leavers experience high levels of teenage parenthood, but the existing UK literature is either now too dated or insufficiently robust to allow reliable estimates of teenage pregnancy risk among CEYP in Scotland.

The systematic review described in the next chapter aims to systematically search for UK studies which may have been missed by the general literature review above. It also aims to glean information from the pattern of teenage pregnancy risk among CEYP internationally, which may help indicate the likely risk of teenage pregnancy among CEYP in the UK. However, even with the systematic review, large gaps in our knowledge of teenage pregnancy risk among CEYP remain, and so the data linkage study described in Chapter 4 was developed.

Chapter 3: Systematic review of the occurrence of teenage pregnancy among CEYP

3.1 Introduction

This chapter presents a systematic review of the occurrence of teenage pregnancy among CEYP in the UK and other very high Human Development Index (HDI) countries, compared with their non-care experienced peers.

3.2 Purpose of review

A systematic review "attempts to collate all empirical evidence that fits pre-specified eligibility criteria to answer a specific research question. It uses explicit, systematic methods that are selected with a view to minimizing bias, thus providing reliable findings from which conclusions can be drawn and decisions made" (Liberati, et al., 2009, p.2).

The purpose of this review was to systematically search for, appraise and synthesise evidence on the occurrence of teenage pregnancy among CEYP compared with their non-care experienced peers. It was undertaken to identify UK studies that may have been missed by the general literature review undertaken for Chapter 2 and to review evidence from non-UK countries which could potentially be applied to the UK setting, to inform the need (or otherwise) for the data linkage study described in Chapter 4.

3.3 Review questions

The objective was to compare the occurrence of teenage pregnancy among CEYP in the UK and other very high HDI countries with that of their non-care experienced peers. It asked:

> *1) Is teenage pregnancy more common among CEYP than their non-care experienced peers?;* and
>
> *2) If so, is teenage pregnancy more common among CEYP than their non-care experienced peers once potential confounding variables are taken into account?*

3.4 Methods

3.4.1 Development of methods

The methodology was developed using guidance for the systematic review of prevalence and incidence data from The Joanna Briggs Institute (2014). The methods were specified in advance and the protocol (Appendix 1) published in the PROSPERO International prospective register of systematic reviews (Hay, Williams and Gavine, 2016).

3.4.2 Inclusion criteria

3.4.2.1 Population

Care experienced population

The review included female CEYP of any ethnicity, socioeconomic status, educational background, cultural background, occupation, sexual orientation or religion. CEYP were defined as young people who are or have been under the care of their local authority or the international equivalent, as defined by the country in which they reside. CEYP were included regardless of placement type, duration in care, reason for leaving care and reason for entering care, with the exception of children in care for respite care purposes only who were excluded.

Studies where all participants were already pregnant (e.g. studies which considered how common a care history was among pregnant participants) were excluded as they do not provide information on how often teenage pregnancy occurs among CEYP, only whether a care history is more common among those already pregnant.

Non-care experienced comparator

The review only included studies that deliberately compared teenage pregnancy occurrence among CEYP with that of their non-care experienced peers. Studies which described teenage pregnancy risk among CEYP but did not compare this to a non-care experienced comparator group were therefore excluded. Studies where the comparison group was not a deliberate part of the study methods (e.g. where comparison was only made in the discussion section) were also excluded.

Acceptable non-looked after comparator groups included groups of non-CEYP and general population-based groups (which will include a small proportion of CEYP).

3.4.2.2 Condition

Outcome of interest

The outcome of interest was the occurrence of teenage pregnancy. To capture as many relevant studies as possible, all measures of teenage pregnancy occurrence were included. For example:

- Rate of pregnancy;
- Age at first pregnancy;
- Proportion pregnant by a specified age such as 16, 18 and 20 years; and
- Proportion pregnant within a certain time period (e.g. within 6 months of leaving care).

Teenage pregnancy definition

Teenage pregnancy was defined as any pregnancy occurring among women aged under 20 years of age, regardless of the pregnancy outcome (i.e. termination, miscarriage or delivery)[10].

Sources of outcome data

The following sources of outcome data were considered acceptable:

- Self-reported;
- Professional reported (e.g. reported by health or social care professionals);
- Case records; and
- Routine health/administrative data (e.g. hospital or birth registration data).

However, some sources were considered more robust than others. For example, national birth registration records and hospital records were considered more reliable than self-reported data (due to the potential reluctance of women to disclose all pregnancies) and social worker reported data (since social workers may not be aware of all pregnancies

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[10] Teenage pregnancy is sometimes defined internationally as pregnancy among those aged 13 to 19 years. This review used the wider definition of pregnancy aged under 20 years.

among their clients, especially among ex-clients). This was reflected in the critical appraisal tool used to assess the methodological quality of studies (Section 3.5.3).

3.4.2.3 Context

Geographical setting

The purpose of the review was to collate evidence relevant to the UK setting. Of most interest therefore were studies from the UK. However, due to the expected lack of UK studies, the review also included studies from other "very high human development" countries based on HDI estimates for 2014 (Jahan, et al., 2015)[11]. It is recognised that different countries have different social care systems and that the experience of one country will not necessarily be generalisable to another. However, given the expected lack of UK data, it was hoped that data from other very high HDI countries may provide useful insights (e.g. patterns or trends) into the likely risk of teenage pregnancy among CEYP in the UK.

Time period

The review was limited to studies published from 1990 onwards. Data extracted could however relate to any time before 1990, if contained within a study published from 1990 onwards.

3.4.2.4 Types of study

Systematic reviews of the effectiveness of interventions usually favour findings from well conducted randomised controlled trials (RCTs) over observational studies such as cohort, case-control or cross-sectional studies (Higgins and Green, 2011). However, this traditional hierarchy of evidence is less relevant to systematic reviews of prevalence and incidence where cohort and cross-sectional studies are more likely to provide

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[11] The HDI uses measures of life expectancy, schooling and standard of living to assess the development of a country. It does not assess dimensions such as inequalities or poverty. The 49 very high HDI countries were: Andorra, Argentina, Australia, Austria, Bahrain, Belgium, Brunei Darussalam, Canada, Chile, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong China (SAR), Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea (Republic of), Kuwait, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Montenegro, Netherlands, New Zealand, Norway, Poland, Portugal, Qatar, Saudi Arabia, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Arab Emirates, United Kingdom and United States (Jahan, et al., 2015).

prevalence and incidence data than RCTs (The Joanna Briggs Institute, 2014). All study designs were therefore included, including:

- RCTs, variants of non-RCTs (e.g. quasi-randomised, controlled before-and-after, cluster controlled) and interrupted time series;
- Cohort studies (prospective and retrospective);
- Case-control studies;
- Cross sectional studies; and
- Other surveys.

3.4.3 Search strategy

3.4.3.1 Language restrictions

Only English language articles were included due to resource constraints in translating non-English papers.

3.4.3.2 Bibliographic databases

The following databases were searched in January/February 2017 and again in January 2021:

- Applied Social Sciences Index and Abstracts
- Cochrane Library
- Cumulative Index to Nursing & Allied Health
- Education Resource Information Center
- EMBASE
- Health Management Information Consortium
- MEDLINE
- Midwives Information & Resource Service: Maternity and Infant Care
- Psychology and Behavioural Sciences Collection
- PsycINFO
- Social Care Online
- Sociological Abstracts
- Web of Science

The PreMEDLINE (Medline In Process and Other Non-Indexed Citations) database was searched in 2017 but was not included in the search update in 2021 due to database access difficulties.

3.4.4.3 Grey literature

The research repositories of all Scottish universities, UK universities known to be active in teenage pregnancy or CEYP research and other UK research organisations were searched in October/November 2017 and again in February 2021 to identify relevant grey literature, as were the websites of various health, social care and children's related organisations (Appendix 2).

3.4.4.4 Other sources

The reference lists of all included studies and of recent literature reviews by: Eastman, Palmer and Ahn (2019); Fallon and Broadhurst (2015); Svoboda et al. (2012); and Winter, Brandon-Friedman and Ely (2016) were reviewed to identify further relevant studies.

3.4.4.5 Search terms

The specific search strategy used for each database is given in Appendix 3. Searches were undertaken by combining search terms for the population of interest (i.e. CEYP) with search terms for the outcome of interest (i.e. teenage pregnancy). For example:

- POPULATION TERMS: adopted child/ or adopted child* or adoptee* or aging out or ageing out or alternative family care or care leav* or leaving care or child* in care or children* home or foster care or foster care/ or foster child* or foster home* or foster place* or foster youth or group care (limited to under age 18 years) or kinship care or "LAYP" or "LACYP" or local authority care or "looked after" or out of home care or out of home placement* or public care (limited to under age 18 years) or residential care (limited to under age 18 years) or residential care/ (limited to under age 18 years) or secure adj (unit* or home* or accom*) (limited to under age 18 years) or state care or substitute care or supervision adj (requirement or order*)

COMBINED WITH

- OUTCOME TERMS: abortion/ or abortion* or adolescent mother/ or (adolescen* and mother*) or adolescent parent/ or (adolescen* and parent*) or adolescent pregnancy/ or pregnancy/ or pregnan* or pregnancy termination/ or reproductive health/ or sexual behavior/ or sexual health/ or "sexual behavior" or "sexual behaviour" or "sexual health" or "sexual risk" or teen* conception or teen* mother* or teen* mum* or teen* parent* or termination of pregnancy

Each database search was adjusted to account for variations in how search terms are indexed. International variations in the terminology used to refer to CEYP were also taken into account.

The grey literature searches used a simpler approach (Appendix 2).

3.4.4 Data collection and analysis

3.4.4.1 Study selection

Relevant studies were identified from the bibliographic database searches as follows:

- References were imported into EndNote reference management software and duplicates removed by the first reviewer.
- Titles were screened by the first reviewer and clearly irrelevant articles excluded.
- Abstracts of the remaining articles were reviewed independently by the first reviewer and a second reviewer, before discussing and agreeing which articles were clearly irrelevant and should be excluded.
- The full text of the remaining articles were reviewed independently by the first and second reviewer, before discussing and agreeing which studies should be excluded.
- Where the eligibility of a study remained unclear attempts were made by the first reviewer to contact the authors for further information.

The grey literature and reference lists of included studies were reviewed by the first reviewer to identify additional relevant studies, which were then discussed with a second reviewer.

Multiple reports of the same study were collated so that each study (rather than each article) formed the "unit of interest" for the review (The Cochrane Public Health Group, 2011, p.10).

A third reviewer was available throughout the review process to resolve outstanding differences between the first and second reviewers but was not required[12].

3.4.4.2 Data extraction

Data were extracted from each included study using a standardised data extraction form (Appendix 4). The form was adapted from the Joanna Briggs Institute's data extraction form for prevalence and incidence studies (The Joanna Briggs Institute, 2014), pilot-tested on a small number of studies and refined accordingly. Data were extracted by the first reviewer and checked by a second reviewer.

The authors of four included studies (Ericsson, 2012; James, et al., 2009; Oman, et al., 2018; Vinnerljung and Sallnäs, 2008) were contacted for further information to supplement data presented in the published papers. All responded but were unable to provide additional data.

3.4.4.3 Assessment of methodological quality

Observational studies are vulnerable to various forms of bias. The methodological quality and risk of bias for each included study was assessed using the Joanna Briggs Institute critical appraisal checklist for studies reporting prevalence data (Appendix 5) which considers the possibility of bias in the design, conduct and analysis of the study (Munn, et al., 2014; The Joanna Briggs Institute, 2017). It asks:

1. Was the sample frame appropriate to address the target population?

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[12] The review authors were: Laura Hay (first reviewer); Anna Gavine (second reviewer); Damien Williams (second reviewer); and Lorna Watson (third reviewer).

2. Were study participants sampled in an appropriate way?
3. Was the sample size adequate?
4. Were the study subjects and the setting described in detail?
5. Was the data analysis conducted with sufficient coverage of the identified sample?
6. Were valid methods used for the identification of the condition?
7. Was the condition measured in a standard, reliable way for all participants?
8. Was there appropriate statistical analysis?
9. Was the response rate adequate, and if not, was the low response rate managed appropriately?

A detailed explanation of each appraisal question is provided in Appendix 5. Each study was appraised independently by the first and second reviewer, before discussing and agreeing a joint decision for each question for each study.

3.4.4.4 Data synthesis

Where there is sufficient homogeneity among studies, meta-analysis can be used to combine the results of similar, individual studies to determine the overall effect (The Joanna Briggs Institute, 2014). However, meta-analyses of observational studies can be more challenging than meta-analyses of RCTs due to the higher risk of bias within and between studies and increased heterogeneity (Metelli and Chaimani, 2020). If there is too much heterogeneity meta-analysis is not valid and can be misleading (Deeks, Higgins and Altman, 2021) and narrative synthesis is more appropriate.

In this review, high levels of clinical heterogeneity and methodological heterogeneity were expected due to variability in the study design, the outcomes measured and the risk of bias in included studies[13]. Data extracted from the included studies on the populations studied, the outcomes assessed, the measures of risk used and the risk of bias in each study were therefore examined to assess if there was sufficient homogeneity to allow meta-analysis to be performed. If there had been sufficient

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[13] Clinical heterogeneity includes variability in the participants and outcomes studied while methodological heterogeneity includes variability in study design, outcome measurement tools and risk of bias (Deeks, Higgins and Altman, 2021).

homogeneity among studies, meta-analysis would have been undertaken using a random effects model with assessment of statistical heterogeneity using the I-squared statistic and assessment of publication bias using funnel plot analysis. In this review, meta-analysis was not appropriate due to high levels of methodological and clinical heterogeneity and so a narrative synthesis was undertaken.

The narrative synthesis involved organising the data to identify emerging themes and patterns to answer the review questions. This included tabulation of findings and the grouping of findings by important characteristics (McKenzie and Brennan, 2019). Summarising the data involved presenting unadjusted and adjusted summary measures such as the odds ratio (for binary outcomes), the hazard ratio (for time-to-event outcomes) or the difference in means (for continuous outcomes), where available. When odds ratios were not presented by study authors but could be calculated using data provided in the paper, odds ratios were calculated by the first reviewer using the Campbell Collaboration’s Practical Meta-Analysis Effect Size Calculator (Wilson, 2018).

3.5 Results

3.5.1 Study selection results

The results from the study selection process are shown in Figure 3.1. It was not possible to locate one paper (Das and Palevsky, 2000). In total, 27 studies reported in 32 papers were included.

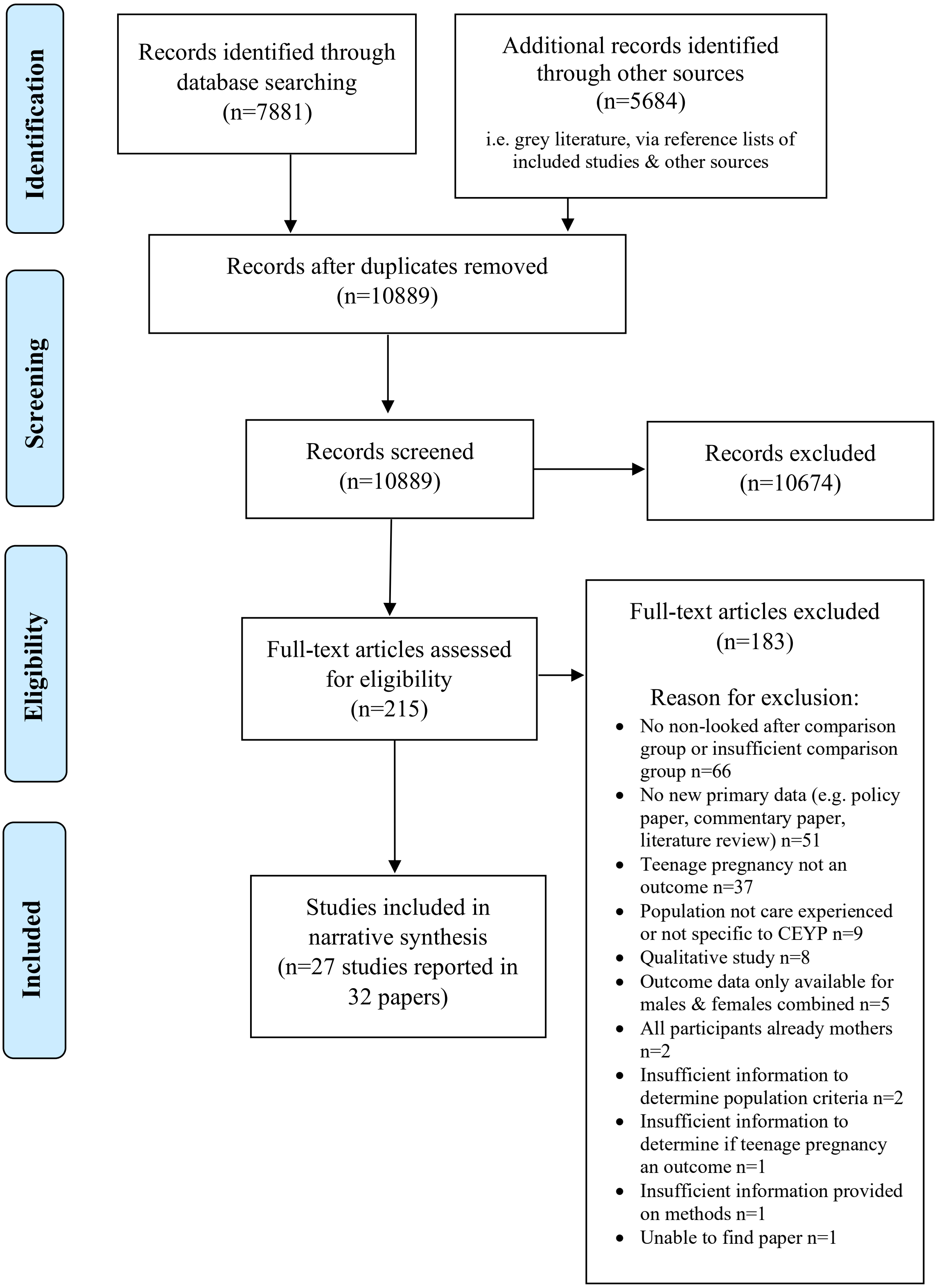

Figure 3.1: PRISMA flowchart of study selection process (Moher, et al., 2009)

3.5.2 Description of studies

3.5.2.1 Summary table

Table 3.1 summarises the location, design and population characteristics of the 27 included studies. Additional details on the geographical location, study period, exclusion criteria and care exposure are provided in Appendix 6. Of note, Table 3.1 describes the care exposure as cited in each study. However, placement terminology varies between countries. The term ‘foster care’, for example, has a much broader meaning in the United States (US) than the UK. Appendix 6 provides further details on placement settings, where available.

3.5.2.2 Geographical setting and time period

The majority of studies (sixteen) were from the US (Table 3.1). Four studies were from Sweden, three from Denmark and two from Finland. Only two were from the UK.

All studies were published from 1990 onwards but the time period studied varied (Appendix 6), ranging from study populations born from the late 1940s onwards (Pecora, et al., 2003) to those born as recently as 2001 (Oman, et al., 2018).

3.5.2.3 Study design

Fifteen studies were data linkage studies using data from national population-based registers, State agencies or other administrative data sources (Table 3.1). Six were longitudinal studies, one was a cross-sectional study, one was a retrospective survey of foster care alumni, one was a baseline survey for a RCT, one was a national audit of young people presenting to health services, one involved analysis of statewide health insurance data and one involved analysis of mother-child relationship data held within a child welfare administrative data system.

Sample sizes ranged from relatively small studies such as Wilson et al. (2014) with a sample size of 417 to very large national data linkage studies such as Brännström, Vinnerljung and Hjern (2016) with a sample size of 727,196.

Table 3.1: Summary table of included study characteristics

SOURCE	STUDY TYPE	POPULATION		
Author* & study location	**Study design**	**Participants**	**Care exposure[†]**	**Non-looked after comparison**
Barrett, et al. (2015), US	Retrospective cohort design using linkage of data from State agencies, comparing outcomes for a group of females with a juvenile delinquency history with a group of females without a juvenile delinquency history, matched by gender, ethnicity and age	Female adolescents (half had history of juvenile delinquency, half did not) n=69,228	History of placement in foster care 4.1% of total sample had been in foster care (7.0% of delinquent group & 1.1% of non-delinquent group)	No placement in foster care
Brännström, Vinnerljung and Hjern (2016), Sweden (plus Brännström, Vinnerljung and Hjern, 2015)	Retrospective cohort study using data linkage of national, longitudinal register data	All females born in Sweden 1973-1989 n=727,196	History of in-home care (IHC) or out-of-home care (OHC) from birth to age 18 (n=29,325)	Majority population (i.e. no registered child welfare intervention, n=697,871)
Cameron, et al. (2018)[‡], Finland	Birth cohort study (The 1987 Finnish Birth Cohort) using data linkage of national registers	All females born in Finland in 1987 surviving the perinatal period n=29,041	Ever placed in OHC before 18th birthday (n=963 approximately)	No history of OHC
Carpenter, et al. (2001), US	Cross-sectional study using data from Cycle 5 of 1995 National Survey of Family Growth Cycle 5 response rate 79%	Females aged 15-44 n=9,620	Self-reported childhood living situation: • Ever lived in foster care (n=89) • Ever lived in kinship care (n=513)	Never lived in foster or kinship care (n=9,018)

			If experienced both care types, categorised as foster care.	
Christoffersen (2003)§, Denmark	Retrospective cohort study using data linkage of national, longitudinal register data	National birth cohort of 41,362 women born in Denmark in 1966	History of foster or residential care Proportion in care not stated	No history of foster or residential care
Christoffersen and Hussain (2008), Denmark	Retrospective cohort study using data linkage of national, longitudinal register data	National birth cohort of 26,824 women in Denmark born in 1981	History of at-home care or OHC Proportion in care unclear	No history of being in care
Christoffersen and Lausten (2009)§, Denmark	Retrospective cohort study using data linkage of national, longitudinal register data	National birth cohort of 41,362 women born in Denmark in 1966	History of at-home care or OHC Proportion in care not stated	No history of being in care
Courtney, et al. (2014), US	Survey of foster youth transitioning to adulthood, using self-reported interview data. Survey was undertaken to provide baseline data for the California Youth Transitions to Adulthood Study (CalYOUTH), a prospective, longitudinal study of foster youth outcomes. Response rate: not stated for females (95% for males & females combined)	Females aged 16.75-17.75 years at time of sampling who had been in California foster care system under supervision of county child welfare agencies for at least six months n=426	In foster care for at least 6 months at time of sampling (i.e. aged 16/17)	Nationally representative females from National Longitudinal Study of Adolescent Health ('Add Health' study) n=not stated
Craine, et al. (2014), Wales	National audit of under 18 year olds presenting as pregnant to health services in Wales. Audit included both retrospective and	14-17 year olds presenting as pregnant to health services in Wales, n=812	Currently looked after children As recorded by clinician answering audit question "*Is looked after children team involved now?*"	Non-LAC in general population in Wales National statistics used for non-LAC denominator (n=72,980)

	prospective data collection by clinicians. Response rate 43%	Split by LAC status and compared with national population statistics	National statistics used for LAC denominator (n=800)	
Doyle (2007), US	Data linkage study using data from State agencies and medical service payment records, comparing outcomes for children on the margin of placement based on the different removal tendencies of child protection investigators	Females referred to Child Welfare Services (CWS): • With a first investigation of parental abuse or neglect 1990-2001; • Receiving Medicaid prior to investigation; • Aged 5-15 at time of investigation; and • Aged at least 15 at end of sample period. n=20,091	Investigated by CWS and placed in foster care (n=not stated)	Investigated by CWS but not placed in foster care i.e. remained at home (n=not stated)
Dworsky and Courtney (2010), US (plus Courtney, Terao and Bost, 2004; Courtney, et al., 2005; Courtney and Dworsky, 2006)	Longitudinal study of foster youth transitioning from care, using self-reported interview data from first two waves of the Midwest Evaluation of the Adult Functioning of Former Foster Youth Wave 1 response rate: not stated for females (95% for males & females combined)	Females in OHC at age 17 who had been in state care for at least 1 year prior to their 17th birthday Wave 1 (aged17/18): n=374 Wave 2 (aged 19 approximately): n=316	In OHC at age 17	Nationally representative females from 'Add Health' study: • At age 17/18: n=794 • At age 19: n=288
Ericsson (2012), Sweden	Retrospective cohort study using data linkage of national, longitudinal register data	All female registered citizens in Sweden between ages 14-19 during 2006-2008 n=487,115	Child welfare clients (n=17,679) in IHC, OHC or residential care	• Total population (n=487,115)

				• Majority population (defined as not subjected to societal care or adoption, n=not stated)
Font, Cancian and Berger (2019), US	Retrospective cohort study using statewide linked administrative data system	Female youth in Wisconsin aged 7-13 in 2004, split by: • Entered foster care, n=4,040 • Experienced Child Protective Services (CPS) involvement but not placed in care, n=18,869 • Low income but no CPS-involvement and not placed in care, n=48,915	Entered foster care on/after July 2004 (aged 7-13) and before 18th birthday	• Investigated by CPS on/after July 2004 but not placed in care • Low-income youth but no CPS-involvement & not placed in care
Gardner, et al. (2016), US	Retrospective cohort study using statewide health care data from a research reference database	Females in Wyoming aged 15-18 split by care and health insurance status: • In foster care and receiving Medicaid, n=743 • On Medicaid but not in foster care, n=2636 • Covered by private insurance but not in foster care, n=1947	Continuously in foster care age 15-18	Not in foster care and continuously enrolled in respective health plan age 15-18
Hobcraft (1998), Britain	Birth cohort study using longitudinal survey data from the 1958 National Child Development Study Response rate for females not stated Response rate males & females combined • 1958: 98% • Age 33: 61%	Females born in first week of March 1958 n=5,632	Ever experienced care or fostering 1.9% of total sample had experienced care/fostering	Living in another family type (i.e. not in care/fostering) e.g. living with natural, adoptive or step-parents

James, et al. (2009), US	Prospective cohort study using longitudinal data from interviews from first four waves of the National Survey on Child and Adolescent Wellbeing (NSCAW) Response rate: not stated for females (74% for males & females combined)	Female youth with an investigation of abuse or neglect opened by the child welfare system Oct 1999-Dec 2000 n=500	Experienced OHC during course of study Proportion in care not stated	CWS-involved but remained at home (i.e. not placed in OHC)
King, et al. (2014), US (plus Putnam-Hornstein, et al., 2013)	Cross-sectional study using linkage of data from State agencies	All females aged 15-17 in California's foster care system between 2006-2010 n=62,402 person years in total 2006-2010	In foster care (aged 15-17)	General population California n=over 4 million person years in total 2006-2010
King (2017), US	Prospective cohort study using longitudinal population-based, linked administrative data from State agencies	CWS-involved girls with substantiated allegation of maltreatment after their 10th birthday n=85,766	Placed in foster care age 10 onwards (n=23,267) Foster care defined as any entry into foster care lasting at least 8 days occurring between age 10 and date of conception (if gave birth) or end of study period	CWS-involved but remained at home (i.e. not placed in foster care or placed in foster care for less than 8 days, n=62,499)
Lee (2009), US	Retrospective cohort study using administrative data	CWS-involved females with a history of child abuse and neglect n=467	Exited from at least one episode of foster care Foster care group divided into those receiving Family Preservation Services prior to entering foster care (n=113) and those not (n=152)	CWS-involved and received Family Preservation Services but did not enter foster care (n=202)

Leppälahti, et al. (2016)[‡], Finland	Retrospective cohort study using data linkage of national, longitudinal register data	National birth cohort of all girls born in 1987 in Finland surviving perinatal period n=29,041	Foster care placement in childhood (n=939)	No foster care placement in childhood
Needell, et al. (2002), US	Retrospective cohort study using data linkage of administrative data	Females emancipating from foster care in California on reaching age of majority n=not stated	Emancipated from Child Welfare or Probation supervised foster care	General population California n=not stated
Oman, et al. (2018), US	Baseline survey using self-reported questionnaire data, undertaken as part of the *POWER Through Choices* randomised controlled trial Response rate among youths in participating group homes: 98%	Female youth aged 13-18 living in group homes n=221	In group home (serving youth in child welfare and/or juvenile justice systems)	Nationally representative survey data n=not stated
Pecora, et al. (2003), US	Survey of foster care alumni, involving alumni interviews and case records review Interview response rate: not stated for females (73% for males & females combined) Case record availability: not stated	Female foster youth in Casey Family Program 1966-1998 n=not stated (879 for other study outcomes)	Placed in Casey foster care for 12 months or more and discharged from foster care at least 12 months prior to the study	General population of unmarried teenage women across US in 1998 n=not stated
Shaw, et al. (2010), US	Cross-sectional analysis of mother-child relationship data from child welfare administrative data system	Female youth in child welfare supervised OHC in Maryland, 2000-2009 n=not stated	In OHC during the year studied	General population Maryland n=not stated

Vinnerljung, Franzén and Danielsson (2007), Sweden	Retrospective cohort study using data linkage of national, longitudinal register data	All female children born in Sweden 1972-1983, still alive and residing in Sweden at age 20 n=573,606	Received registered in-home or OHC before age 18 (n=22,992)	Majority population (i.e. those without registered experience of in-home or OHC before age 18, n=550,614)
Vinnerljung and Sallnäs (2008), Sweden	Cohort study using data linkage of national register data	Females aged 13-16 entering Swedish OHC in 1991 n=348	Placed in OHC during early teens (age 13-16)	Majority population peers after OHC study group excluded, n=not stated
Wilson, et al. (2014), US	Prospective cohort study using longitudinal data from interviews from the first three waves of the National Survey on Child and Adolescent Wellbeing (NSCAW) II NSCAW II response rate Wave 1: 56%. Wave 3: not stated	CWS-involved females aged 11 and older at baseline n=417	Ever placed in OHC (n=144)	CWS-involved but no history of OHC (n=273)

CPS (Child Protective Services); CWS (Child Welfare Services); IHC (in-home care); LAC (looked after children); and OHC (out-of-home care).

*For studies with multiple papers, all papers are listed above but hereafter the lead paper is used.

†Care exposure is as described in the cited paper. Placement terminology varies between countries. Further details of care exposure are provided in Appendix 6.

‡Cameron, et al. (2018) and Leppälahti, et al. (2016) used the same national birth cohort but different care exposures/outcomes so are listed separately.

§Christoffersen (2003) and Christoffersen and Lausten (2009) used the same national birth cohort but different care exposures/outcomes so are listed separately.

3.5.2.4 Population characteristics

The characteristics of the care experienced populations varied considerably across studies (Appendix 6). For example:

- *Care placement setting:* All studies included some form of care outside the family home. Six Nordic studies also included in-home/at-home care.
- *Age while in care:* Many studies considered children in care at any point during their childhood, regardless of their age when in care. Others focused on children entering care or in care at a particular age (e.g. during adolescence) or those in care at the age of transitioning to adulthood i.e. young people 'ageing out' of the care system.
- *Duration in care:* Almost all studies placed no restriction on the duration of care among the care experienced population. However, four studies included only those who had been in care for a minimum length of time.

The characteristics of the non-care experienced populations also varied:

- *General population, majority population or nationally representative comparators:* Twenty studies used either a general population, majority population (representing the general population but with the care experienced group excluded) or nationally representative survey data as the comparator.
- *CWS-involved comparators:* Five US studies used CWS-involved but non-looked after children (i.e. children who were investigated by CWS but who did not enter care) as the comparator. Although not placed in care, these groups may still have experienced considerable adverse life circumstances leading to CWS involvement. They therefore represent a potentially 'high risk' comparator, compared with general population, majority population or nationally representative comparators.
- *Other 'high risk' comparators:* In one US study half of all participants had a history of juvenile delinquency (Barrett, et al., 2015). The non-looked after group therefore also represents a potentially 'high risk' comparator, compared with general population, majority population or nationally representative comparators.

- *Both a general population and CWS-involved comparator:* One US study (Font, Cancian and Berger, 2019) used both a CWS-involved but non-looked after comparator and a general population comparator of low-income youth who had no CWS-involvement and no care history.

Due to considerable heterogeneity among both the care experienced and non-care experienced populations, meta-analysis was not appropriate. For the narrative synthesis, results were grouped by the broad type of comparator (i.e. general population, majority population or nationally representative versus CWS-involved or other 'high risk' comparators) to examine differences in teenage pregnancy risk by comparator type.

3.5.2.5 Outcomes measured and source of outcome data

Studies varied in whether they considered: becoming pregnant as a teenager (i.e. teenage conception); teenage induced abortion; teenage childbirth or motherhood; or a combination as the outcome. Due to the wide variation in how outcomes were measured meta-analysis was not appropriate.

Becoming pregnant as a teenager

Eight studies used one or more measures of becoming pregnant as a teenager (i.e. conceptions) as an outcome (Carpenter, et al., 2001; Christoffersen and Hussain, 2008; Courtney, et al., 2014; Craine, et al., 2014; Dworsky and Courtney, 2010; James, et al., 2009; Oman, et al., 2018; Wilson, et al., 2014). All used different definitions (e.g. different age definitions). James et al. (2009) restricted its outcome to pregnancies as a result of consensual sex. All used self-reported data except for Christoffersen and Hussain (2008) which used national register data to measure pregnancy by combining data on induced abortions and births (but not miscarriages) and Craine et al. (2014) which used clinician reported data.

Teenage induced abortion

Only three studies considered teenage induced abortion as a specific outcome (Christoffersen, 2003; Christoffersen and Hussain, 2008; Leppälahti, et al., 2016). All three were Nordic data linkage studies which used national register data as the outcome source, but each used a different age range for the outcome definition.

Teenage childbirth or motherhood

Twenty-one studies measured teenage childbirth or becoming a teenage mother. Studies varied in whether they considered all births or just the first birth. The age range of outcomes considered also varied:

- Barrett et al. (2015), Doyle (2007), Vinnerljung, Franzén and Danielsson (2007) and Vinnerljung and Sallnäs (2008) used the broadest definition, measuring births aged under 20.
- Dworsky and Courtney (2010) considered having a child by age 19.
- King (2017) measured births aged 12-19 years.
- Christoffersen and Hussain (2008), Christoffersen and Lausten (2009) and Ericsson (2012) considered births aged 14-19 years.
- Christoffersen (2003) and Shaw et al. (2010) considered births aged 15-19.
- Brännström, Vinnerljung and Hjern (2016) measured births aged 17-19 years.
- Needell et al. (2002) considered births to 18 year olds and 19 year olds.
- Lee (2009) and Leppälahti et al. (2016) considered births under age 18.
- Gardner et al. (2016) considered births aged 15-18.
- King et al. (2014) measured births aged 15-17 years.
- Font, Cancian and Berger (2019) considered births conceived aged 13-17.
- Hobcraft (1998) and Cameron et al. (2018) studied becoming a teenage mother and Pecora et al. (2003) studied the teenage birth rate, but did not specify an age range.

All studies used national or State based birth statistics or other administrative sources of births data except for Hobcraft (1998) and Dworsky and Courtney (2010) which used self-reported data and Pecora et al. (2003) which used a combination of self-reported data, case record reviews and national births data.

3.5.3 Assessment of study quality

The proportion of studies meeting each critical appraisal criteria is shown in Figure 3.2. The proportion varied by item, ranging from 44% for item 8 to 89% for item 2.

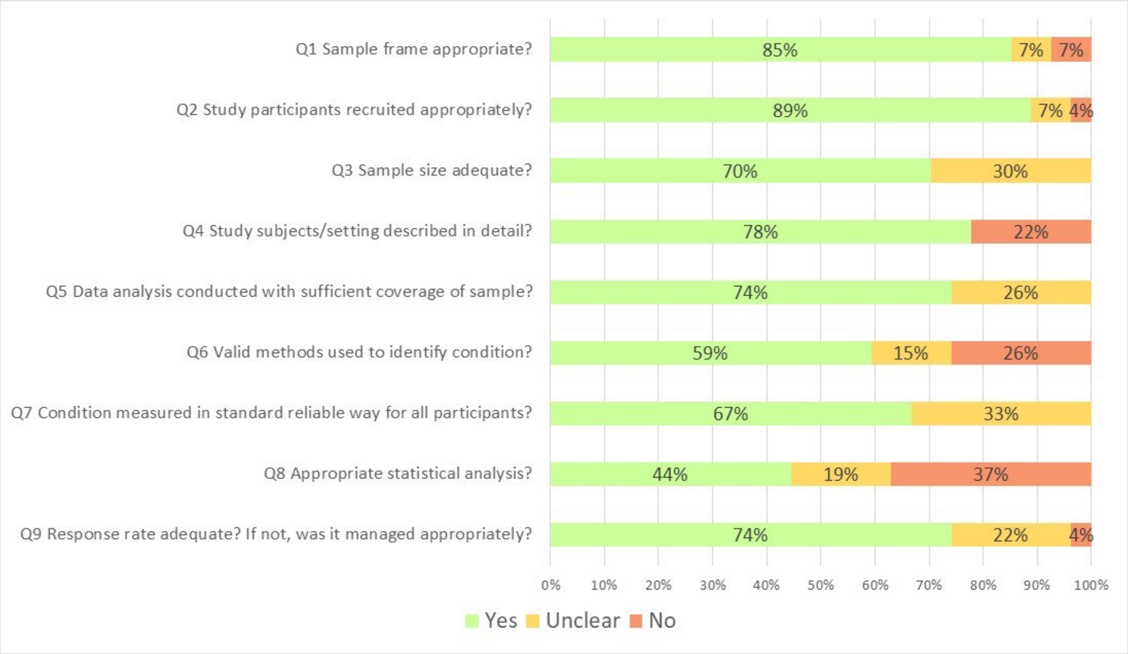

Figure 3.2: Proportion of studies meeting the criteria for each item in The Joanna Briggs Institute (2017) critical appraisal checklist for studies reporting prevalence data

The quality of individual studies varied considerably (Table 3.2). Seven studies scored “Yes” for all items. All other studies scored at least one “No” or “Unclear”. One study (Shaw, et al., 2010) scored “No” or “Unclear” across all items. An assessment of each study is provided in Appendix 7 but issues of note included:

- *Use of comparator from different time period:* Both Courtney et al. (2014) and Pecora et al. (2003) were limited by their use of a comparator from a different time period to the care experienced population studied. For Courtney et al. (2014) this may have underestimated the difference in risk between the care experienced and non-care experienced group while in Pecora et al. (2003) it may have overestimated the risk difference.

Table 3.2: Assessment of studies against The Joanna Briggs Institute (2017) critical appraisal checklist for studies reporting prevalence data

Study	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**
Barrett, et al., 2015	Y	Y	Y	Y	Y	Y	Y	Y	Y
Brännström, Vinnerljung and Hjern, 2016	Y	Y	Y	Y	Y	Y	Y	Y	Y
Cameron, et al., 2018	Y	Y	Y	Y	Y	U	Y	U	Y
Carpenter, et al., 2001	Y	Y	Y	Y	Y	N	Y	Y	Y
Christoffersen, 2003	Y	Y	Y	Y	Y	Y	Y	Y	Y
Christoffersen and Hussain, 2008	Y	Y	Y	Y	Y	Y	Y	Y	Y
Christoffersen and Lausten, 2009	Y	Y	Y	Y	Y	Y	Y	Y	Y
Courtney, et al., 2014	N	Y	U	Y	Y	N	Y	N	Y
Craine, et al., 2014	Y	Y	Y	Y	U	Y	U	Y	N
Doyle, 2007	Y	Y	U	Y	Y	Y	Y	U	Y
Dworsky and Courtney, 2010	Y	Y	Y	Y	Y	N	U	U	Y
Ericsson, 2012	Y	Y	Y	Y	Y	Y	Y	U	Y
Font, Cancian and Berger, 2019	Y	Y	Y	Y	Y	Y	U	Y	Y
Gardner, et al., 2016	Y	Y	Y	N	U	U	U	Y	U
Hobcraft, 1998	Y	Y	Y	N	U	N	U	N	U
James, et al., 2009	Y	Y	U	Y	Y	N	Y	N	Y
King, et al., 2014	Y	Y	Y	Y	Y	Y	Y	Y	Y
King, 2017	Y	Y	Y	Y	Y	Y	U	Y	Y
Lee, 2009	U	U	Y	N	U	Y	Y	N	U
Leppälahti, et al., 2016	Y	Y	Y	Y	Y	Y	Y	N	Y
Needell, et al., 2002	Y	Y	U	N	Y	Y	Y	N	Y
Oman, et al., 2018	Y	N	Y	Y	Y	N	U	N	Y
Pecora, et al., 2003	N	Y	U	N	U	U	U	N	U
Shaw, et al., 2010	U	U	U	N	U	U	U	N	U
Vinnerljung, Franzén and Danielsson, 2007	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vinnerljung and Sallnäs, 2008	Y	Y	U	Y	Y	Y	Y	N	Y
Wilson, et al., 2014	Y	Y	U	Y	U	N	Y	U	U

Y=YES N=NO U=UNCLEAR

- *Potential for response bias*: Some studies did not state the response rate and did not compare the characteristics of respondents versus non-respondents (e.g. Lee, 2009; Pecora, et al., 2003; Wilson, et al., 2014) leading to the potential for response bias. The response rate in the Welsh audit by Craine et al. (2014) was only 43% with the potential for response bias in either direction.

- *Potential recall bias with self-reported data:* Several studies used self-reported outcome data (Carpenter, et al., 2001; Courtney, et al., 2014; Dworsky and Courtney, 2010; Hobcraft, 1998; James, et al., 2009; Oman, et al., 2018; Pecora, et al., 2003; Wilson, et al., 2014). Some used computer aided self-interview techniques to encourage disclosure of sensitive outcomes but underreporting of outcomes is still likely due to poor memory recall or social desirability, particularly for highly sensitive outcomes such as induced abortions (Kelly, et al., 1997). Self-reported data may therefore underestimate the true proportion experiencing the outcome. If underreporting varies by care experience this may introduce bias due to differential reporting of outcomes. It has been suggested that CWS-involved youth may be particularly reluctant to report sensitive, personal events due to increased fear of the potential repercussions such as CWS intervention or increased supervision from carers (James, et al., 2009; Wilson, et al., 2014). If so, studies using self-reported outcome data may underestimate the risk of teenage pregnancy among CEYP when compared with their general population, majority population or nationally representative peers.

- *Use of different age definition for comparator:* The age range of pregnancy considered in Oman et al. (2018) varied between the care experienced group (ever pregnant aged 13-18) and general population comparator (ever pregnant before age 20). This will have underestimated the true difference in risk between the two groups.

- *Insufficient statistical analysis for outcome of interest:* Several studies did not undertake sufficient statistical analysis (or provide sufficient raw data) for the review’s outcomes of interest. This is reflected in the poor scoring of many studies for critical appraisal item 8 (Figure 3.2). For example, several studies did not provide important data, such as numerator and denominator data for outcomes, which limited calculation of the statistical significance of differences between groups and prevented the calculation of odds ratios.

- *Lack of accounting for potential confounders:* Several studies did not account for potential confounding variables in their analysis.

3.5.4 Narrative synthesis

3.5.4.1 Becoming pregnant as a teenager (conceptions)

Eight studies considered becoming pregnant as a teenager (i.e. teenage conceptions).

Proportion becoming pregnant as a teenager

Six studies compared the proportion of CEYP becoming pregnant as a teenager with that of their non-care experienced peers (Courtney, et al., 2014; Craine, et al., 2014; Dworsky and Courtney, 2010; James, et al., 2009; Oman, et al., 2018; Wilson, et al., 2014).

CEYP were consistently more likely to become pregnant as a teenager than their general population, majority population or nationally representative peers (Table 3.3). This was statistically significant in three studies (Courtney, et al., 2014; Craine, et al., 2014; Dworsky and Courtney, 2010) with the statistical significance unknown in the fourth study (Oman, et al., 2018). In Illinois, Iowa and Wisconsin, for example, almost one third (32.9%) of females in OHC at age 17 who had been in care for at least one year had been pregnant by age 17/18 years, compared with 13.5% of nationally representative peers ($p<0.001$) (Dworsky and Courtney, 2010).

In contrast, no statistically significant differences were observed in the proportion of CEYP becoming pregnant as a teenager compared with their CWS-involved but non-looked after peers (James, et al., 2009; Wilson, et al., 2014), with high levels of self-reported pregnancy among both the care experienced and CWS-involved but non-looked after groups (Table 3.3).

Table 3.3: Summary table of studies (n=8) reporting becoming pregnant as a teenager (conceptions)

SOURCE	**CONDITION**		**FINDINGS**			
Study & critical appraisal summary*	**Outcome(s) measured & source of outcome data**		**Proportion with outcome by care exposure**	**Unadjusted risk**	**Adjusted risk**	**Factors accounted for in adjusted analysis (if applicable)**
Studies with general population, majority population or nationally representative comparator						
Carpenter, et al. (2001), US YYYYYNYYY	Mean age at first conception	Self-reported	History of kinship care: 19.1 years History of foster care: 19.2 years No history of foster/kinship care: 21.0 years	Difference in mean age: • Kinship care: 22.8 months younger than those with no history of foster/kinship care (p<0.001) • Foster care: 21.6 months younger than those with no history of foster/kinship care (p<0.001)	Difference in mean age: • Kinship care: 8.6 months younger than those with no history of foster/kinship care (p<0.001) • Foster care: 11.3 months younger than those with no history of foster/kinship care (p<0.05)	• Race • Unwanted first sexual experience in a minor • Age at first voluntary sexual experience • Age at time of interview • Educational status • Education level of parental figures • Maternal marital status when respondent was born • Rurality
Christoffersen and Hussain (2008), Denmark YYYYYYYYY	First time pregnancy aged 14-19 (included induced abortions and births but not spontaneous abortions)	National register data	History of at-home care or OHC: Not available No history of care: Not available Total sample: 9.8%	OR 4.3 (p<0.0001) for at-home care/OHC	OR 1.8 (p<0.0001) for at-home care/OHC	• Parental substance abuse • Parental mental illness • Domestic violence • Parental suicidal behaviour • Battered child syndrome • Family separation • Respondent born to teenage mother

						• Parental professional qualifications • Parental unemployment • Parental poverty • Parental disability pension • Ethnic group • Psychiatric disorder • Attempted suicide • Drug addicted • Alcohol abuse
Courtney, et al. (2014), US NYUYYNYNY	Ever been pregnant by time of interview (approximately age 17)	Self-reported	Foster youth: 26% Nationally representative adolescents: 10% Difference between groups $p<0.05$	Not available	Not available	N/A
Craine, et al. (2014), Wales YYYYUYUYN	Pregnancy age 14-17	Clinician reported	Current LAC: 5% (95% CI 3.3%-6.7%) Non-LAC: 0.8% (95% CI 0.7%-0.8%) Difference between groups $p<0.001$	OR 6.7 (95% CI 4.8-9.3) for current LAC†	Not available	N/A
Dworsky and Courtney (2010), US YYYYYNUUY	Ever been pregnant by age 17/18	Self-reported	In OHC at age 17: 32.9% Nationally representative adolescents: • 13.5% (unadjusted) • 18.4% (adjusted for race)	OR 2.96 (95% CI 2.21-3.96) for OHC†	OR 2.20 (95% CI 1.67-2.92) for OHC†	• Race

			Nationally representative adolescents (unadjusted) vs OHC p<0.001 Nationally representative adolescents (adjusted for race) vs OHC p<0.001			
	Ever been pregnant by age 19	Self-reported	In OHC at age 17: 50.6% Nationally representative adolescents: • 20.1% (unadjusted) • 27.3% (adjusted for race) Nationally representative adolescents (unadjusted) vs OHC p<0.001 Nationally representative adolescents (adjusted for race) vs OHC p<0.001	OR 4.07 (95% CI 2.83-5.85) for OHC†	OR 2.74 (95% CI 1.95-3.85) for OHC†	• Race
Oman, et al. (2018), US YNYYYNUNY	Ever been pregnant: • By time of interview (aged 13-18) for group home youth • Before age 20 (for general population)	Self-reported	Group home youth: 37.7% (95% CI 31.3-44.1) General population: 23.7% (95% CI not available) Statistical significance not available	Not available	Not available	N/A

Studies with CWS-involved or other 'high risk' comparator						
James, et al. (2009), US YYUYYNYNY	Ever been pregnant as a result of consensual sex (by time of interview aged 14-17)	Self-reported	Placed in OHC: 25.9% CWS-involved but not placed in OHC: 18.2% No statistically significant difference between groups (p>0.05)	Not available	OR 1.97 (95% CI 0.41-9.45) for OHC	• Age at end of study • Race • Maltreatment type • Initial risk assessment • Behaviour problems • Use of hard drugs • Delinquency • Deviant peers • Caregiver abuse • Caregiver education • School engagement • Future expectations • Religiosity • Caregiver monitoring • Caregiver connectedness
Wilson, et al. (2014), US YYUYUNYUU	Pregnancy between Wave 1 (aged 11-17) and Wave 3 (aged 14-20)	Self-reported	History of OHC: 20.3% CWS-involved but no history of OHC: 30.0% No statistically significant difference between groups (p>0.1)	Not available	Not available	N/A

CI (confidence interval); CWS (Child Welfare Services); LAC (Looked After Children); N/A (Not Applicable); OHC (out-of-home care); and OR (odds ratio).
*Full critical appraisal scores are provided in Section 3.5.3. †Calculated by first reviewer using data provided in the paper.

The proportion of CEYP becoming pregnant as a teenager varied considerably by study ranging from 5% of current LAC aged 14-17 in Wales (Craine, et al., 2014) to over half (50.6%) of those aged 19 transitioning from care in Illinois, Iowa and Wisconsin (Dworsky and Courtney, 2010).

Odds of becoming pregnant as a teenager

Four studies compared the odds of CEYP becoming pregnant as a teenager with those of their non-care experienced peers (Christoffersen and Hussain, 2008; Craine, et al., 2014; Dworksy and Courtney, 2010; James, et al., 2009).

In three studies which used the majority population or nationally representative adolescent peers as the comparator, the odds of pregnancy were statistically significantly higher among CEYP (Christoffersen and Hussain, 2008; Craine, et al., 2014; Dworksy and Courtney, 2010). The unadjusted odds of pregnancy ranged from 2.96 to 6.7 times higher among CEYP than their majority population or nationally representative peers (Table 3.3). Adjusting for potential confounders reduced these odds, with the adjusted odds (where available) ranging from 1.8 to 2.74 but remaining statistically significantly higher among CEYP than their majority population or nationally representative peers.

Only one study compared the odds of becoming pregnant as a teenager for CEYP compared with their CWS-involved but non-looked after peers (James, et al., 2009). This found no statistically significant difference in the adjusted odds of pregnancy aged 14-17 when CEYP were compared with their CWS-involved but non-looked after peers (Table 3.3).

Age at first conception

The US study by Carpenter et al. (2001) measured mean age at first conception and found that those with a history of kinship or foster care were on average statistically significantly younger at first conception compared with their nationally representative peers, even after adjusting for factors such as race, educational attainment and age at first voluntary sexual experience (Table 3.3).

3.5.4.2 Teenage induced abortion

Only three studies considered teenage induced abortion as an outcome (Christoffersen, 2003; Christoffersen and Hussain, 2008; Leppälahti, et al., 2016). All were large, high quality data linkage studies from Denmark or Finland which used the majority population as the comparator.

Proportion experiencing teenage induced abortion

Little data were available on the proportion of CEYP experiencing teenage induced abortion (Table 3.4). Among women born in Finland in 1987, 8.5% of those with a history of foster care experienced a first pregnancy before age 18 ending in induced abortion compared with 3.6% of the total population (Leppälahti, et al., 2016).

Odds of experiencing teenage induced abortion

In all three studies the odds of experiencing teenage induced abortion were statistically significantly higher among CEYP than their majority population peers (Table 3.4).

In the Danish studies, the unadjusted odds of teenage induced abortion were 4.4 times higher among CEYP born in Denmark in 1966 (Christoffersen, 2003) and 3.8 times higher among CEYP in Denmark born in 1981 (Christoffersen and Hussain, 2008), compared with the majority population (Table 3.4). These odds fell to 3.1 and 1.7 times higher respectively among CEYP than their majority population peers, once adjusted for several potential confounders, but both adjusted odds remained statistically significantly higher among CEYP. Interestingly, the largest reduction in odds was seen in Christoffersen and Hussain (2008) which adjusted for a wider range of potential confounders than Christoffersen (2003).

Among women born in Finland in 1987 (Leppälahti, et al., 2016) the adjusted odds of a first pregnancy before age 18 ending in induced abortion was 1.5 times higher (OR 95% CI 1.1-1.9) among those with a history of foster care compared with their majority population peers once adjusted for a wide range of factors such as mental health and parental factors (Table 3.4).

Table 3.4: Summary table of studies (n=3) reporting induced abortion

SOURCE	CONDITION		FINDINGS			
Study & critical appraisal summary*	**Outcome measured & source of outcome data**		**Proportion with outcome by care exposure**	**Unadjusted risk**	**Adjusted risk**	**Factors accounted for in adjusted analysis (if applicable)**
Christoffersen (2003), Denmark YYYYYYYYY	Having induced abortion for first time aged 15-19	National register data	History of foster/residential care: Not available No history of foster/residential care: Not available Total sample: 5.7%	OR 4.4 (p<0.0001) for foster/residential care	OR 3.1 (95% CI 2.7-3.6) for foster/residential care	• Parental substance abuse • Family separation • Respondent born to teenage mother • Teenager had been battered/neglected • Teenager had given birth to a child • Psychiatric disorder
Christoffersen and Hussain (2008), Denmark YYYYYYYYY	Having induced abortion for first time aged 14-19	National register data	History of at-home care or OHC: Not available No history of care: Not available Total sample: 6.9%	OR 3.8 (p<0.0001) for at-home care/OHC	OR 1.7 (p<0.0001) for at-home care/OHC	• Parental substance abuse • Parental mental illness • Domestic violence • Parental suicidal behaviour • Battered child syndrome • Family separation • Respondent born to teenage mother • Parental professional qualifications • Parental unemployment • Parental poverty • Parental disability pension • Ethnic group • Psychiatric disorder • Attempted suicide • Drug addicted • Alcohol abuse

						• Previous year given birth to a child
Leppälahti, et al. (2016), Finland YYYYYYYNY	First pregnancy before age 18 ending in induced abortion	National register data	History of foster care: 8.5% No history of foster care: Not available Total sample: 3.6%	Not available	OR 1.5 (95% CI 1.1-1.9) for foster care	• Parental highest education • Maternal socioeconomic status • Rurality • Perinatal problems • Chronic physical illness • Any psychiatric disorder • Psychoactive substance use disorders • Mood disorders • Neurotic and stress-related disorders • Early-onset behavioural and emotional disorders • Maternal age at childbirth <20 and <18 • Maternal history of induced abortion • Maternal history of smoking during pregnancy • Parental psychiatric in-patient care • Maternal cancer

CI (confidence interval); OHC (out-of-home care); and OR (odds ratio). *Full critical appraisal scores are provided in Section 3.5.3.

3.5.4.3 Teenage childbirth or motherhood

Twenty-one studies considered teenage childbirth or motherhood, albeit with considerable variation in the populations studied, outcomes measured and study quality.

Proportion experiencing teenage childbirth or motherhood

Twelve studies measured the proportion of CEYP experiencing teenage childbirth or motherhood compared with their general population, majority population or nationally representative peers (Table 3.5). In all but one study, CEYP were more likely to experience teenage childbirth or motherhood than their general population, majority population or nationally representative peers. The exception was Needell et al. (2002) which found slightly lower birth rates among 18 years olds emancipating from Child Welfare supervised foster care, compared with the general population (although the statistical significance of the difference was not known).

Across the twelve studies, the proportion of CEYP experiencing teenage childbirth or motherhood varied considerably, depending on the population and age of childbirth studied. The lowest levels were observed in the study of 14-19 year olds in Sweden by Ericsson (2012) where 1.0% of those entering care before age 12 and 1.7% of those entering care after age 12 had given birth, compared with 0.2% of the total population. Relatively low rates were also observed among 15-17 year olds in California where the annual birth rate among those in foster care was 3.2% compared with 2% for the general population (King, et al., 2014). In contrast, the highest rates were observed among foster youth transitioning from care in Illinois, Iowa and Wisconsin (Dworksy and Courtney, 2010) where 32% of females who had been in OHC at age 17 reported having at least one child by age 19, compared with 12% of their nationally representative peers ($p<0.001$).

Interestingly, despite Sweden having a much lower national teenage birth rate than the US (Sedgh, et al., 2015), three Swedish studies (Brännström, Vinnerljung and Hjern, 2016; Vinnerljung, Franzén and Danielsson, 2007; Vinnerljung and Sallnäs, 2008) found high levels of teenage childbirth or motherhood among CEYP in Sweden. For example, in Vinnerljung, Franzén and Danielsson (2007), 14% of CEYP had given birth

Table 3.5: Summary table of studies (n=21) reporting teenage childbirth or motherhood

SOURCE	**CONDITION**		**FINDINGS**			
Study & critical appraisal summary*	**Outcome(s) measured & source of outcome data**		**Proportion with outcome by care exposure**	**Unadjusted risk**	**Adjusted risk**	**Factors accounted for in adjusted analysis (if applicable)**
Studies with general population, majority population or nationally representative comparator						
Brännström, Vinnerljung and Hjern (2016), Sweden YYYYYYYYY	First childbirth aged 17-19	National register data	History of: • IHC: 8.6% • Short OHC before teens: 10.7% • Long OHC before teens: 10.1% • Teen placement OHC: 14.4% Majority population: 2.3% Difference between majority population and each care group: all p<0.0001[†]	Compared with majority population: • IHC: OR 3.80 (95% CI 3.49-4.14) • Short OHC before teens: OR 4.91 (95% CI 4.47-5.40) • Long OHC before teens: OR 4.91 (95% CI 4.38-5.40) • Teen placement OHC: OR 7.44 (95% CI 7.00-7.91) All care groups combined: Not available[‡]	Compared with majority population: • IHC: OR 1.48 (95% CI 1.35-1.61) • Short OHC before teens: OR 1.30 (95% CI 1.17-1.43) • Long OHC before teens: OR 0.93 (95% CI 0.82-1.05) • Teen placement OHC: OR 2.10 (95% CI 1.95-2.23) All care groups combined: Not available	• Birth cohort year • Maternal birth country • Intergenerational transmission of teenage parenthood • Maternal civil status (single parenthood) • Household economic adversity • Maternal educational level • Parental substance abuse • Parental mental health problems • Parental criminality • School failure
Cameron, et al. (2018), Finland YYYYYUYUY	Teenage parent (not defined further)	Finnish Medical Birth Register	Placed in OHC: 19.6% No history of OHC: 3.7%	Not available	Not available	N/A

			Difference between groups: p<0.0001†			
Christoffersen (2003), Denmark YYYYYYYYY	Becoming a teenage mother aged 15-19	National register data	History of foster/residential care: Not available No history of foster/residential care: Not available Total sample: 2.9%	OR 8.1 (p<0.0001) for foster/residential care	OR 4.1 (95% CI 3.5-4.8) for foster/residential care	• Parental substance abuse • Family separation • Respondent born to teenage mother • Parental unemployment • Parental no vocational training • Teenager had been battered/neglected • Teenager had had an induced abortion • Psychiatric disorder
Christoffersen and Hussain (2008), Denmark YYYYYYYYY	Becoming a teenage mother aged 14-19	National register data	History of at-home care or OHC: Not available No history of care: Not available Total sample: 3.9%	OR 5.8 (p<0.0001) for at-home care/OHC	OR 1.7 (p<0.0001) for at-home care/OHC	• Parental substance abuse • Parental mental illness • Domestic violence • Parental suicidal behaviour • Battered child syndrome • Family separation • Respondent born to teenage mother • Parental professional qualification • Parental unemployment • Parental poverty • Parental disability pension • Ethnic group • Psychiatric disorder • Attempted suicide • Drug addicted • Alcohol abuse • Induced abortion previous year

Christoffersen and Lausten (2009), Denmark YYYYYYYYY	First childbirth (live birth) aged 14-19	National register data	History of at-home care or OHC: Not available No history of care: Not available Total sample: 5.9%	OR 5.7 (p<0.0001) for at-home care/OHC	OR 1.5 (p<0.0001) for at-home care/OHC	• Parental substance abuse • Parental mental illness • Domestic violence • Parental suicidal behaviour • Child abuse or neglect • Not living with parents • Family separation • Intergenerational transfer teenage motherhood • Parental criminal conviction • Parental vocational qualification • Parental unemployment • Parental poverty • Parental disability pension • Disadvantaged area • Rented housing • Unemployment • Not in training/education • Graduated • Poverty • Psychiatric disorder • Attempted suicide • Drug addicted • Alcohol abuse • Married
Dworsky and Courtney (2010), US YYYYYNUUY	Having at least one child by age 19	Self-reported	In OHC at age 17: 31.6% Nationally representative adolescents: 12.2% Difference between groups p<0.001	Not available	Not available	N/A

Ericsson (2012), Sweden YYYYYYYUY	Births, aged 14-19	National register data	Care entry: • Before age 12: 1.0% • After age 12: 1.7% Total population: 0.2% Difference between total population and each care group: p<0.0001[†]	Compared with majority population Care entry before age 12: • Age 15: OR 11.48 (95% CI 3.98-33.14) • Age 16: OR 6.25 (95% CI 3.46-11.31) • Age 17: OR 6.22 (95% CI 4.23-9.10) • Age 18: OR 6.00 (95% CI 4.64-7.75) • Age 19: OR 4.18 (95% CI 3.37-5.19) Care entry after age 12: • Age 15: OR 19.04 (95% CI 8.82-41.09) • Age 16: OR 7.48 (95% CI 4.79-11.76) • Age 17: OR 10.49 (95% CI 8.21-13.41) • Age 18: OR 8.10 (95% CI 6.77-9.68) • Age 19: OR 6.21 (95% CI 5.40-7.15)	Compared with majority population Care entry before age 12: • Age 15: OR 7.29 (95% CI 2.41-22.11) • Age 16: OR 3.34 (95% CI 1.81-6.16) • Age 17: OR 4.02 (95% CI 2.72-5.96) • Age 18: OR 3.64 (95% CI 2.80-4.74) • Age 19: OR 2.75 (95% CI 2.21-2.43) Care entry after age 12: • Age 15: OR 11.32 (95% CI 4.84-26.46) • Age 16: OR 4.59 (95% CI 2.81-7.49) • Age 17: OR 7.42 (95% CI 5.68-9.68) • Age 18: OR 5.26 (95% CI 4.33-6.40) • Age 19: OR 3.89 (95% CI 3.34-4.54)	• Born in Sweden • Geographic location • Maternal education level • Maternal country of birth • Child of teen mother • Drug abuse • Criminality
Gardner, et al. (2016), US YYYNUUUYU	Childbirth at age 15/16/17/18	Statewide healthcare records (including private health insurance and	Foster care: • Age 15: 3.2% • Age 16: 3.9% • Age 17: 7.8% • Age 18: 14.3% Medicaid but no foster care:	Foster care vs Medicaid: • Age 15: OR 2.2 (95% CI 1.3-3.7)[#] • Age 16: OR 1.5 (95% CI 0.9-2.3)[#] • Age 17: OR 1.5 (95% CI 1.1-2.0)[#]	Not available	N/A

		Medicaid data)	• Age 15: 1.5% • Age 16: 2.7% • Age 17: 5.5% • Age 18: 7.8% Statistically significantly different from foster care for age bands 15/17/18 ($p<0.05$) but not age 16 ($p>0.05$)[†] Private insurance but no foster care: • Age 15: 0.2% • Age 16: 0.1% • Age 17: 0.5% • Age 18: 0.7% Statistically significantly different from foster care for age bands 15/16/17/18 (all $p<0.0001$)[†]	• Age 18: OR 2.0 (95% CI 1.5-2.5)[#] Foster care vs Private insurance: • Age 15: OR 21.6 (95% CI 6.5-72.0)[#] • Age 16: OR 39.5 (95% CI 9.4-166.0)[#] • Age 17: OR 18.2 (95% CI 9.0-37.0)[#] • Age 18: OR 23.0 (95% CI 13.1-40.4)[#]		
Hobcraft (1998), Britain YYYNUNUNU	Becoming a teenage mother (not defined further)	Self-reported	History of care/fostering: Not available No history of care/fostering: Not available Total sample: 11.8%	Not available	Model 1: OR 2.83 ($p<0.05$) for ever in care/fostering compared with peers who spent childhood with both natural parents	Model 1: • Poverty • Contact with police
					Model 2: OR 2.44 ($p<0.05$) for ever in care/fostering compared with peers who spent childhood with both natural parents	Model 2: • Poverty • Contact with police • Social class of origin • Social class during childhood • Housing tenure

						- Parental interest in the child's schooling - Personality attributes ('aggression', 'anxiety', and 'restlessness') - Educational test scores
King, et al. (2014), US YYYYYYYYY	Births aged 15-17 Foster care birth rates refer to being in foster care during the calendar year of giving birth	Births data from California Department of Public Health	Average annual birth rate 2006-2010: - In foster care: 3.2 per 100 - General population: 2.0 per 100 Statistical significance not available	Foster care (all racial/ethnic groups) compared with general population: - 2006: OR 1.5 (95% CI 1.4-1.7)† - 2007: OR 1.6 (95% CI 1.5-1.8)† - 2008: OR 1.5 (95% CI 1.3-1.6)† - 2009: OR 1.7 (95% CI 1.6-1.9)† - 2010: OR 1.9 (95% CI 1.7-2.1)†	Not available	N/A
Leppälahti, et al. (2016), Finland YYYYYYYNY	First pregnancy before age 18 ending in childbirth	National register data	History of foster care: 7.5% No history of foster care: Not available Total sample: 1.4%	Not available	OR 3.0 (95% CI 2.3- 4.1) for foster care	- Parental highest education - Maternal socioeconomic status - Rurality - Perinatal problems - Chronic physical illness - Any psychiatric disorder - Psychoactive substance use disorders - Mood disorders - Neurotic and stress-related disorders - Early-onset behavioural and emotional disorders

						- Maternal age at childbirth <20 and <18 - Maternal history of induced abortion - Maternal history of smoking during pregnancy - Parental psychiatric in-patient care - Maternal cancer
Needell, et al. (2002), US YYUNYYYNY	Births to 18 year olds	Births data from California Department of Health Services	Emancipated from: - Child Welfare supervised foster care: 76.3 per 1,000 - Probation supervised foster care: 98.4 per 1,000 General population: 86.6 per 1,000 Statistical significance not available	Not available	Not available	N/A
	Births to 19 year olds	As above	Emancipated from: - Child Welfare supervised foster care: 112.2 per 1,000 - Probation supervised foster care: 244.9 per 1,000 General population: 110.5 per 1,000	Not available	Not available	

			Statistical significance not available			
Pecora, et al. (2003), US NYUNUUUNU	Teenage birth rate (not specified further)	Foster care alumni: Self-reported and case record reviews General population: U.S. Census Bureau, Current Population Survey	Foster care: "at least 17.2%" (authors unable to specify further due to missing data) General population of unmarried teenage women: 8.2% Statistical significance not available	Not available	Not available	N/A
Shaw, et al. (2010), US UUUNUUUNU	Birth rate aged 15-19	OHC group: State Automated Child Welfare Information System General population: Maryland Department of Health	In OHC during the year: 2001: 98.0 per 1000 2002: 115.3 per 1000 2003: 95.0 per 1000 2004: 86.0 per 1000 2005: 82.9 per 1000 2006: 89.0 per 1000 2007: 99.8 per 1000 2008: 92.7 per 1000 General population: 2001: 37.8 per 1000 2002: 35.4 per 1000 2003: 33.3 per 1000 2004: 32.3 per 1000 2005: 31.8 per 1000 2006: 33.6 per 1000 2007: 34.4 per 1000 2008: 32.7 per 1000	Not available	Not available	N/A

			Statistical significance not available			
Vinnerljung, Franzén and Danielsson (2007), Sweden YYYYYYYYY	Birth of first child before age 20	Swedish Multigenerational Register	• IHC before teens: 9.2% • Short-term care before teens: 11.5% • Intermediate care before teens: 15.4% • IHC during teens: 15.7% • Short-term care during teens: 19.2% • Intermediate care during teens: 16.8% • Long-term care: 11.8% • Grown up in care: 9.3% All care groups combined: 13.7%[#] Majority population: 2.9% Difference between majority population and each care group: $p<0.0001$[†]	Compared to majority population: • IHC before teens: OR 3.5 (95% CI 3.2-3.9)[†] • Short-term care before teens: OR 4.5 (95% CI 4.1-5.0)[†] • Intermediate care before teens: OR 6.4 (95% CI 5.5-7.5)[†] • IHC during teens: OR 6.5 (95% CI 5.7-7.4)[†] • Short-term care during teens: OR 8.3 (95% CI 7.7-8.9)[†] • Intermediate care during teens: OR 7.1 (95% CI 6.3-7.9)[†] • Long-term care: OR 4.7 (95% CI 4.1-5.4)[†] • Grown up in care: OR 3.6 (95% CI 3.1-4.2)[†] All care groups combined: OR 5.6 (95% CI 5.4-5.8)[†]	Not available	N/A
Vinnerljung and Sallnäs	Teenage parenthood	Swedish Multigenera-	Placed in OHC during early teens for:	Not available	Not available	N/A

(2008), Sweden YYUYYYYNY	before age 20	tional Register	- Behaviour problems: 26.9% - Other reasons: 14.1% Majority population: 3.1% Statistical significance not available			
Studies with CWS-involved or other 'high risk' comparator						
Barrett, et al. (2015), US YYYYYYYYY	Given birth to one or more children at age 19 or younger	Births data from South Carolina Department of Health and Environmental Control	History of foster care: 44%† No history of foster care: 26%† Difference between groups p<0.0001†	OR 2.23 (p<0.001) for foster care	OR 0.73 (p<0.001) for foster care	- Race - Eligible for free/reduced lunch - Maltreatment - DSM-IV mental health diagnoses - School-related disabilities - Delinquency status
Doyle (2007), US YYUYYYYUY	Childbirth aged 19 years or younger	Medicaid Paid Claims data	35% of total sample had a teen birth, with those entering foster care having a 9-10% higher teen birth rate (proportion by group not specified further) Not statistically significant	Not available	Not available	Study used the rotational assignment of cases to child protection investigators and variability in the placement tendency of investigators as quasi-randomisation of placement into care versus no placement into care for those on the margins of placement. No statistically significant differences were found between the groups for: initial reporter; age at report; race/ethnicity; type of allegation; location; and year. It is not known how well the process 'randomised' other characteristics.

King (2017), US YYYYYYUYY	First birth aged 12-19	Births data from California Department of Public Health	Placed in foster care: 19.5 per 100 CWS-involved but not placed in foster care: 17.2 per 100 Difference between groups p<0.001	HR (i.e. 'hazard of a first birth') 1.15 (95% CI 1.11-1.19) for foster care	HR 1.10 (95% CI 1.06-1.14) for foster care	• Race/ethnicity • Age at first substantiated maltreatment • Maltreatment history (including type & recurrence of maltreatment)
Lee (2009), US UUYNUYYNU	Childbirth before age 18	Administrative data including birth records	Exited from foster care: 24% FPS only (received FPS but not placed in foster care): Not available	Not available	• Foster care with FPS vs FPS only: HR 1.77, p=0.06 • Foster care without FPS vs FPS only: HR 1.46, p=0.15	• Race • Parental education • Parental age at birth of first child • Median household income • Number of Child Abuse and Neglect reports • Maltreatment type • Age at service initiation • Substantiation of index event • Participation in Family Centred Services • Aid to Families with Dependent Children (income assistance) • Parental mental health treatment
Studies with both a general population and CWS-involved comparator						
Font, Cancian and Berger (2019), US YYYYYYUYY	Gave birth to a child conceived aged 13-17	Wisconsin Multi-Sample Person File (including data from Medicaid and contact	Foster care: 23.2% CPS-involvement but not placed in care: 17.1% SNAP (low-income but no CPS-involvement): 9.1%	Foster care vs CPS but no care: OR 1.5 (95% CI 1.3-1.6)† Foster care vs SNAP: OR 3.0 (95% CI 2.8-3.3)†	Foster care vs CPS but no care: Not available Foster care vs SNAP: HR 2.54 (p<0.001)	• Race/ethnicity • Year of birth • Supplemental Security Income (childhood disability proxy) • Early Economic Experiences (aged 0-5): welfare receipt; Supplemental Nutrition Assistance Program (SNAP)

		with public services after birth)	Difference between foster care & each of other groups: p<0.01		Foster care vs SNAP by timing of placement: • Birth conceived before entering foster care: HR 3.63 (p<0.001) • Birth conceived during foster care placement: HR 1.66 (p<0.001) • Birth conceived after exiting foster care: HR 2.72 (p<0.001)	receipt; average maternal wages; and average maternal quarters employed • Mother under 20 at first birth • Age of mother at youth's birth • Child support/paternity • Number of children to mother • Number of fathers to mother's children • Marital status at child's birth • Mother incarcerated at child age 0–5

CI (confidence interval); CPS (Child Protective Services); CWS (Child Welfare Services); DSM-IV (Diagnostic and Statistical Manual of Mental Disorders, 4th Edition); FPS (Family Preservation Services); HR (hazard ratio); IHC (in-home care); N/A (not applicable); OHC (out-of-home care); OR (odds ratio); and SNAP (Supplemental Nutrition Assistance Program benefits, formerly Food Stamps).

*Full critical appraisal scores are provided in Section 3.5.3. †Estimated by first reviewer using data provided in paper and subject to rounding errors during calculation. ‡Not stated in paper and unable to reliably calculate from data provided in paper due to multiple rounding errors in the calculation. #Estimated by first reviewer using data provided in paper.

to their first child before age 20, compared with 3% of the majority population (p<0.0001). Among the care experienced group, the proportion experiencing teenage childbirth varied by care type, age at first care entry and duration in care, ranging from 9% for those experiencing in-home care before their teens to 19% for those entering short term OHC during their teens. In Vinnerljung and Sallnäs (2008), 27% of those placed in OHC during their early teens for behavioural problems became teenage mothers, compared with 14% of those placed in OHC during their early teens for other reasons and only 3% of their majority population peers (statistical significance not available).

Four studies measured the proportion of CEYP experiencing teenage childbirth compared with their CWS-involved or other 'high risk' but non-looked after peers (Table 3.5). In all four studies, rates were higher among CEYP but the differences were often small, with high rates of teenage childbirth among both groups. For example, in South Carolina in the study by Barrett et al. (2015), where half of all participants had a history of juvenile delinquency, 44% of those with a history of foster care had given birth to one or more children before age 20, compared with 26% of those without a history of foster care (p<0.0001). In California, among CWS-involved girls with a substantiated allegation of maltreatment during adolescence (King, 2017), those placed in foster care were only slightly more likely than those who remained at home to give birth before age 20 (19.5% versus 17.2%, p<0.001). In Font, Cancian and Berger (2019), which used both a low-income general population and a CWS-involved but non-looked after comparator, 23% of foster youth gave birth to a child conceived before age 18 compared with 17% of their CWS-involved but non-looked after peers and 9% of their low-income general population peers, with the rate of early motherhood among foster youth therefore more comparable to that of their CWS-involved but non-looked after peers than their low-income general population peers.

Odds of teenage childbirth or motherhood

Nine studies compared the unadjusted odds of teenage childbirth or motherhood among CEYP compared with their majority or general population peers (Brännström, Vinnerljung and Hjern, 2016; Christoffersen, 2003; Christoffersen and Hussain, 2008;

Christoffersen and Lausten, 2009; Ericsson, 2012; Font, Cancian and Berger, 2019; Gardner, et al., 2016; King, et al., 2014; Vinnerljung, Franzén and Danielsson, 2007). In all nine studies CEYP were more likely to experience teenage childbirth or motherhood, with the unadjusted odds ranging from 1.5 to 39.5 times higher among CEYP than their majority or general population peers (Table 3.5). These increased odds were statistically significantly higher in all studies with the exception of the unadjusted odds of childbirth at age 16 between the foster care and Medicaid groups in Gardner et al. (2016). Interestingly, in Brännström, Vinnerljung and Hjern (2016) the unadjusted odds of first childbirth aged 17-19 varied by time in care and age at first placement, being lowest among those receiving IHC and highest among those entering OHC in their teens. Similarly, in Vinnerljung, Franzén and Danielsson (2007), the unadjusted odds of childbirth before age 20 were lowest among those in IHC before their teens and highest among those entering short-term OHC during their teens.

Eight studies provided an adjusted odds or hazard ratio for teenage childbirth or motherhood among CEYP compared with their general population, majority population or nationally representative peers (Brännström, Vinnerljung and Hjern, 2016; Christoffersen, 2003; Christoffersen and Hussain, 2008; Christoffersen and Lausten, 2009; Ericsson, 2012; Font, Cancian and Berger, 2019; Hobcraft, 1998; Leppälahti, et al., 2016). The adjusted odds ranged from 0.9 to 11.3 times higher among CEYP than their general population, majority population or nationally representative peers, with the adjusted odds being statistically significantly higher among CEYP in all but one study (Table 3.5). The exception was Brännström, Vinnerljung and Hjern (2016) where the adjusted odds of first childbirth aged 17-19 among those entering long term OHC before their teens was slightly lower than their majority population peers (OR 0.9, 95% CI 0.8-1.1). Among studies which provided both an unadjusted and adjusted odds ratio, adjusting for potential confounding variables reduced the odds in all studies. In some studies, adjusting for potential confounders made a substantial difference to the odds observed. For example:

- In Christoffersen and Lausten (2009), the odds of a first live birth aged 14-19 fell from 5.7 times higher among those with a history of at-home care or OHC compared with those with no care history to only 1.5 times higher, once adjusted for a wide range of potential confounding factors.

- In Christoffersen and Hussain (2008), the odds of becoming a teenage mother aged 14-19 fell from 5.8 times to 1.7 times higher among those with a history of at-home care or OHC compared with those with no care history once adjusted for a wide range of factors such as ethnicity, psychiatric disorder, induced abortion the previous year, intergenerational transfer of teenage motherhood and various parental factors such as mental health, unemployment and income.

The pattern of risk appeared to be different in studies which used a CWS-involved or other 'high risk' but non-looked after comparator. Three studies compared the unadjusted risk of teenage childbirth among CEYP with their CWS-involved or other 'high risk' but non-looked after peers (Barrett, et al., 2015; King, 2017; Font, Cancian and Berger, 2019). In all three studies the unadjusted odds or hazard ratio of teenage childbirth were statistically significantly higher among CEYP than their CWS-involved or other 'high risk' but non-looked after peers (Table 3.5). However, the level of the increased risk did not appear to be as marked as that previously observed when CEYP were compared with their majority or general population peers. For example:

- In King (2017), birth rates were only 15% higher among maltreated adolescents who entered foster care compared with those who remained at home (HR 1.15, 95% CI 1.11-1.19).
- In Font, Cancian and Berger (2019) the unadjusted odds of giving birth to a child conceived when aged 13-17 was only 1.5 times higher among foster youth compared with their CWS-involved but non-looked after peers (OR 1.5, 95% CI 1.3-1.6). This was lower than the unadjusted odds of 3.0 (95% CI 2.8-3.3) observed when foster youth were compared with their low-income general population peers in the same study.

Three studies provided an adjusted odds or hazard ratio of teenage childbirth among CEYP compared with their CWS-involved or other 'high risk' but non-looked after peers (Barrett, et al., 2015; King, 2017; Lee, 2009). The findings were notably mixed:

- In King (2017) the hazard ratio of giving birth before age 20 fell to 1.10 (95% CI 1.06-1.14) among maltreated adolescents entering foster care compared with those remaining at home, once adjusted for race/ethnicity, age at first substantiated maltreatment and maltreatment history, with the adjusted risk remaining statistically significantly higher among the care experienced group.
- In Barrett et al. (2015) the odds of childbirth before age 20 became statistically significantly lower among those with a history of foster care compared with those with no history of foster care (adjusted OR 0.73, $p<0.001$), once adjusted for race, socioeconomic factors, maltreatment, mental health, school-related disabilities and delinquency.
- In Lee (2009) the adjusted hazard ratio of childbirth before age 18 was 1.5-1.8 times higher among those exiting from foster care compared with their CWS-involved peers who received Family Preservation Services but did not enter foster care but these differences were not statistically significant ($p>0.05$).

This suggests there may be a different pattern of risk for teenage childbirth depending on the type of non-looked after comparator used. However, this observation is based on only a small number of studies using a CWS-involved or other high risk comparator, all of which were from the US, so should be interpreted cautiously.

3.6 Discussion

3.6.1 Summary of main findings

The review identified 27 studies which met the inclusion criteria. Meta-analysis was not possible. A narrative synthesis was undertaken instead.

The review asked whether teenage pregnancy is more common among CEYP than their non-care experienced peers and, if so, whether it remains more common once potential confounding variables are taken into account. It found that teenage pregnancy is more common among CEYP than their non-care experienced peers but that some, if not most, of this increased risk is due to confounding factors. Care experience is therefore a marker of teenage pregnancy risk, but not necessarily the cause.

3.6.2 Role of confounding variables

The review clearly shows that, before adjusting for potential confounders, teenage pregnancy is more common among CEYP than their general population, majority population and nationally representative peers. The unadjusted odds of becoming pregnant as a teenager were 3 to 7 times higher among CEYP than their majority population or nationally representative peers and the unadjusted odds of teenage induced abortion four times higher among CEYP than their majority population peers. The unadjusted odds of teenage childbirth or motherhood were between 1.5 to 40 times higher (but commonly 1.5 to 8 times higher) among CEYP than their majority or general population peers. However, when compared with their CWS-involved or other high risk but non-looked after peers, the unadjusted odds or hazard of teenage childbirth were only 1.15 to 2 times higher among CEYP, suggesting the choice of non-looked after comparator is important.

Adjusting for potential confounders showed that the increased risk of teenage pregnancy among CEYP can be explained, at least partly, by confounding variables i.e. by factors associated with both experiencing teenage pregnancy and being in care. For example, the adjusted odds of becoming pregnant as a teenager were only 2 to 3 times higher among CEYP than their majority population or nationally representative peers and the adjusted odds of teenage induced abortion only 1.5 to 3 times higher among CEYP than their majority population peers. The adjusted odds of teenage childbirth or motherhood were also lower at between 0.9 to 11 times higher among CEYP than their general population, majority population and nationally representative peers.

It is difficult to quantify the degree to which the increased risk of teenage pregnancy among CEYP is due to confounders, due to variation in how confounders were measured between studies. However, adjusting for potential confounders reduced the odds of teenage pregnancy considerably in some studies, particularly when a large range of factors were accounted for. It is not known if adjusting for additional confounding factors would have reduced the odds of teenage pregnancy even further. However, the adjusted odds of becoming pregnant as a teenager and teenage childbirth showed no clear pattern of increased risk among CEYP compared with their CWS-involved or other high risk peers. It could be argued that CEYP and their CWS-involved but non-looked after peers are likely to share many of the same background characteristics and so may be comparable on many (although not all) known and unknown confounding factors. This similarity in known and unknown confounding factors may have resulted in the broadly similar levels of teenage pregnancy risk observed between CEYP and their CWS-involved but non-looked after peers. If so, this raises the question of whether the increased teenage pregnancy risk observed among CEYP compared with their general population, majority population and nationally representative peers could potentially be wholly, not just partly, explained by confounding factors, if one were able to account for the full range of known and unknown confounding factors. However, this is based on CWS-involved comparator data from a small number of US studies only, so is conjecture only.

3.6.3 Association does not imply causation

The review shows that care experience is associated with an increased risk of teenage pregnancy, but association does not imply causation. Ultimately, answering whether being in care causes teenage pregnancy would require randomisation of young people into receiving and not receiving care, which would be unethical. Doyle et al. (2007) attempted to use the allocation of cases to child protection investigators with different placement tendencies as quasi-randomisation of the placement of CWS-involved females into foster care versus remaining at home for those on the margins of care. It found a higher (but non-significant) teen birth rate among those placed in care (Table 3.5). However, it was not clear how effective the attempt at pseudo-randomisation was and the study was of low quality, so it is unable to answer whether being placed in care causes an increased risk of teenage pregnancy among CWS-involved youth.

The review cannot answer whether care experience causes teenage pregnancy. However, it suggests that at least part, if not most, of the excess risk of teenage pregnancy observed among CEYP is due to selection factors. It is also worth noting that teenage pregnancy may itself be a factor in becoming looked after. For example, King et al. (2014) found that many of those giving birth whilst in foster care were pregnant before entering or re-entering care.

3.6.4 Does care protect against teenage pregnancy?

Some authors (e.g. King, 2017) have suggested that, for some young people, being in care may actually protect against teenage pregnancy. The review cannot answer this question but Font, Cancian and Berger (2019) found that the risk of early motherhood was greatest before entering and after exiting foster care, rather than during care (Table 3.5), suggesting that foster care may mitigate the risk of early motherhood, due to higher levels of supervision in foster homes and foster carers encouraging behaviours that delay motherhood, for example.

3.6.5 Local assessment of CEYP teenage pregnancy levels

CEYP are more likely to experience teenage pregnancy than the general population. CEYP are therefore likely to have a greater need for teenage pregnancy related services and support than the general population and policy makers and service planners should plan accordingly. However, the review shows that teenage pregnancy levels among CEYP vary considerably, depending on the population studied. Given the potential difficulties in generalising from one population to another, local data on teenage pregnancy levels among CEYP are likely to be needed to better assess local need.

Interestingly, the review found high levels of self-reported pregnancy and teenage childbirth among both CEYP and their CWS-involved but non-looked after peers. This finding was based on only a small number of US studies, so should be interpreted cautiously, but policy makers and service planners may wish to consider the teenage pregnancy related needs of all CWS-involved youth, not just those placed in care.

3.6.6 Teenage pregnancy risk by age at entering care

CEYP are not a homogenous population. While CEYP in general are at increased risk of experiencing teenage pregnancy, the review suggests that some subgroups of CEYP are at higher risk, with those entering care during their teens having the highest risk of teenage childbirth (Brännström, Vinnerljung and Hjern, 2016; Ericsson, 2012; Vinnerljung, Franzén and Danielsson, 2007). This increased risk partly reflects that the pregnancy may have been part of the reason for entering care (King, et al., 2014) but is also thought to reflect greater emotional or behavioural problems among those entering care during adolescence (King, et al., 2014; Vinnerljung and Sallnäs, 2008).

3.6.7 Extending the care leaving age

The high levels of teenage pregnancy experienced by CEYP ageing out of care has led some to suggest that the years between age 17 and 19 are a particularly high risk period for care leavers and a critical time for offering support (Oshima, Narendorf and McMillen, 2013). It has been suggested that extending the care leaving age beyond age 18 may help reduce teenage pregnancy among US foster youth (Dworsky and Courtney, 2010). Assessing the potentially protective effect of extending the care leaving age is outwith the scope of the review but is of interest given the recent extension to the care leaving age in Scotland (Section 2.9).

3.6.8 Progressing pregnancy to childbirth

Birth rates among CEYP are affected by both conception and induced abortion rates (Vinnerljung, Franzén and Danielsson, 2007). The higher teen birth rates observed among CEYP may therefore be due to higher conception rates or to lower induced abortion rates or a combination of both. Qualitative studies suggest that pregnant CEYP may be more likely to progress a pregnancy through to childbirth, compared with their non-looked after peers (Section 2.11.3). This is supported by the limited data in the review. In Craine et al. (2014) pregnant LAC were significantly more likely to progress the pregnancy through to a live birth than non-LAC (70% versus 28%, $p<0.001$). Similarly, foster youth transitioning from care in Illinois, Iowa and Wisconsin who were pregnant by age 17/18 were more likely to progress the pregnancy through to a live birth than their pregnant nationally representative peers (52% versus 20%, statistical significance unavailable, Courtney, Terao and Bost, 2004).

3.6.9 Limitations of the evidence base

3.6.9.1 Overview

The limitations of individual studies were considered in Section 3.5.3. The evidence base as a whole also has limitations.

3.6.9.2 Lack of induced abortion data

It has been suggested that teenagers having an induced abortion differ from those continuing with the pregnancy to birth, with disadvantaged teenagers being more likely to proceed to childbirth than less disadvantaged teenagers (Christoffersen and Hussain, 2008; Leppälahti, et al., 2016). It is therefore important to consider induced abortion and childbirth as separate outcomes. However, the review only identified three studies (all Nordic) of teenage induced abortion among CEYP.

3.6.9.3 Lack of spontaneous abortion data

None of the included studies reported spontaneous abortions (miscarriages) as a specific outcome so it is not possible to assess whether CEYP are more likely to experience a spontaneous abortion than their non-looked after peers.

3.6.9.4 Generalisability of findings to other settings

From a UK perspective, the biggest limitation is the lack of UK studies with only two UK studies (Craine, et al., 2014; Hobcraft, 1998) included in the review despite the extensive literature search undertaken. The remaining 25 studies were from the US or Nordic countries but their findings cannot necessarily be generalised to CEYP in other countries or settings. Teenage pregnancy rates vary considerably internationally (Sedgh, et al., 2015). Child welfare systems also differ between countries, with variation in whether countries use a child welfare or criminal justice approach for managing youth offending, for example (Hammond, 2019; Hazel, 2008). These differences make it difficult to generalise the findings from one country to another. Indeed, even generalising to different populations within the same country may be difficult, for example between different US states which may have quite different State teenage pregnancy rates (Kearney and Levine, 2012) and child welfare approaches (Edwards, 2016). Consequently, one should be cautious applying study findings to other settings. In particular, one should be cautious generalising the review's findings on teenage induced abortion (which are based on only three Nordic studies) and the review's findings relating to CWS-involved but non-looked after comparators which are based on a small number of US studies only.

Having said this, in the absence of local data, the general risk patterns observed in other settings can be useful. For example, the review found an increased teenage pregnancy risk among CEYP compared with the general population across several countries which have markedly different national teenage pregnancy levels (such as the US and UK which have high teenage pregnancy levels and Sweden, Denmark and Finland which have lower teenage pregnancy levels, Sedgh, et al., 2015) and across different care systems. This consistency across different settings strengthens the likelihood that CEYP in other settings will also be at increased risk of teenage pregnancy compared with the general population.

3.6.9.5 Relevance of time period studied

The review only included studies published from 1990 onwards but the study populations covered a much wider time period with study participants in Pecora et al. (2003) born from the late 1940s onwards, Carpenter et al. (2001) born from the 1950s onwards, Hobcraft (1998) born in the 1950s and Christoffersen (2003) and Christoffersen and Lausten (2009) born in the 1960s. Given changes over time in sexual attitudes, societal attitudes to unmarried mothers, access to abortion services, contraceptive advances and child welfare system changes the findings from older studies may be less relevant to current CEYP than more contemporary studies. On the other hand, the broad issues of increased vulnerability and risk behaviour among CEYP may be applicable over time.

3.6.10 Limitations of the review process

3.6.10.1 Publication bias

Despite the extensive searches undertaken, the review is likely to have missed relevant articles. Non-published studies in particular may not have been identified, potentially leading to publication bias (Liberati, et al., 2009; Moher, et al., 2009). Publication bias may be less likely for this particular topic since a negative or null result (e.g. showing no difference in teenage pregnancy risk between CEYP and their non-looked after peers) would be of clinical significance but it is nonetheless possible. More likely perhaps is bias from selective outcome reporting where outcomes are measured but not reported (Liberati, et al., 2009; Moher, et al., 2009). This may apply particularly within studies investigating a broad range of outcomes for CEYP where a negative, null or non-statistically significant teenage pregnancy outcome may not have been reported.

3.6.10.2 Language restrictions

The review included only English language articles which will have limited identification of studies from non-English speaking countries.

3.6.10.3 Odds ratio calculations

The odds ratios calculated for the narrative synthesis (Section 3.4.4.4) were calculated by a single author so there is a small risk of error.

3.6.10.4 Lack of meta-analysis

Finally, the review was unable to undertake a meta-analysis due to considerable heterogeneity in the populations and outcomes studied and so is unable to provide a single overall estimate of the risk of teenage pregnancy among CEYP compared with their non-looked after peers. However, this reflects the reality of the complex nature of child welfare systems and the differing care experiences of young people.

3.7 Conclusions

In conclusion, teenage pregnancy is more common among CEYP than their non-care experienced peers but this increased risk can be explained, at least partly, by confounding variables. Care experience is therefore likely to be a marker of increased teenage pregnancy risk, rather than necessarily being the cause.

The choice of non-looked after comparator appears to be important with broadly similar levels of teenage pregnancy risk observed among CEYP and their CWS-involved but non-looked after peers with high levels of self-reported pregnancy and teenage childbirth in both groups. However, this observation is based on only a small number of US studies and should be interpreted cautiously.

Evidence on teenage induced abortion among CEYP is limited, with only three studies (all Nordic) identified that assessed teenage induced abortion as an outcome. Given the potential difficulties generalising between countries, one should be careful generalising the review's findings on induced abortion to other settings. Further research on induced abortion from non-Nordic countries is needed.

Finally, there is currently insufficient, robust, contemporary UK data on which to reliably base estimates of teenage pregnancy risk among CEYP in the UK. Despite an extensive search, the review identified only two UK studies, both of which had limitations. The pattern of increased risk observed in other countries suggests that CEYP in the UK are likely to be at increased risk of teenage pregnancy but differences between countries makes generalising between settings difficult. Further UK data is needed.

3.8 Research implications

There is a clear need for further research on the risk of teenage pregnancy among CEYP in the UK. Internationally, further research on teenage induced abortion risk among CEYP in non-Nordic countries is needed.

The data linkage study described in Chapter 4 was developed to help address both these research gaps, by considering the occurrence of teenage pregnancy (including both induced abortion and childbirth) among CEYP in Fife compared with their non-looked after peers.

Chapter 4: Local context for developing the data linkage study of teenage pregnancy among CEYP in Fife

4.1 Overview

This chapter describes the local context for the development of the data linkage study described in Chapter 5. The study uses cross-sectoral data linkage to compare teenage pregnancy outcomes for CEYP in Fife with that of their non-care experienced peers. This chapter describes the local background to the study, the methodological approaches considered and why a data linkage approach was chosen.

4.2 Identifying health outcomes for CEYP in Fife

In 2010, the Health Improvement Subgroup of the Fife Corporate Parent Board identified a lack of health outcome data for care leavers in Fife (NHS Fife, 2010). At that time, Scottish health boards were becoming increasingly aware of the health needs of LAC and LAYP whilst in care, following the duty placed on all Scottish health boards to offer health assessments to all newly looked after children and young people (Scottish Government, 2009). However, much less was known about the health of care leavers, with no routine collection of health outcome data for care leavers locally or nationally. As a result, Fife Corporate Parent Board was concerned they had little information on how CEYP in Fife fared on leaving care and entering adulthood, including whether CEYP in Fife were more likely to experience teenage pregnancy than their non-care experienced peers.

As described in chapters 2 and 3, teenage pregnancy among CEYP is an important issue but little is known about teenage pregnancy rates among CEYP in Scotland. Teenage pregnancy is a particularly pressing public health issue in Fife as it has one of the highest teenage pregnancy rates in Scotland among young people generally (Information Services Division, 2010a; Public Health Scotland, 2021a). Fife Corporate Parent Board was therefore keen to determine teenage pregnancy rates among CEYP in Fife and the data linkage study described in this thesis was consequently developed. Given the lack of robust, contemporary data on teenage pregnancy rates among CEYP in the UK generally, the study's findings are also expected to be of interest to health boards and local authorities elsewhere in Scotland and further afield.

4.3 Why was a data linkage approach chosen?

4.3.1 Consideration of alternative study designs

Having formulated the research question "Are CEYP in Fife more likely to experience teenage pregnancy than their non-looked after peers?" several potential methodological approaches were considered. A randomised controlled trial (where study participants would be allocated randomly to being looked after or not looked after) was clearly not appropriate. However, a prospective cohort and case-control study design were both considered before a data linkage approach was chosen.

4.3.2 Prospective cohort study

A prospective cohort study would involve recruiting CEYP and non-CEYP, collecting data on their characteristics and behaviours (e.g. via questionnaires or face-to-face interviews) and then following participants up over time to observe the outcomes for each group. This could include seeking permission from participants to access their health records to track health outcomes. Since data would be collected prospectively, this approach has the advantage of being able to collect bespoke data on a wide range of issues, including data on care experience and potential confounding variables. However, a prospective cohort study would also:

- Be expensive to conduct.
- Be time consuming (for both participants and researchers).
- Rely on individual consent for participation, leading to response bias if participants differ in some important way from non-participants, which in turn would reduce the generalisability and usefulness of the results. Since CEYP may be difficult to engage in research (Billings, Hashem and Macvarish, 2007; Dale and Watson, 2010; Mezey, et al., 2015) this is a significant limitation.
- Likely suffer from losses to follow-up if direct follow-up of participants is required. CEYP may be difficult to follow up over time, due to unstable accommodation on leaving care for example (McGhee, et al., 2014), so this is an important limitation.

- Be difficult to reproduce for subsequent cohorts (e.g. to monitor trends over time) without considerable ongoing resources.

Therefore, while offering the advantage of being able to collect bespoke data, a prospective cohort study was deemed not feasible due to the resources required and the potential for bias from non-response and losses to follow-up.

4.3.3 Case-control study

In a case-control study a group of ‘cases’ (i.e. those with a teenage pregnancy) and a group of ‘controls’ (i.e. those without a teenage pregnancy) could be identified (e.g. from national maternity data). Care experience could then be ascertained to determine whether cases were more, or less, likely to have been in care than the control group. However, accurately determining care experience would be difficult. Approaching participants to ask them about their care history would be time consuming. CEYP may be particularly difficult to recruit and may not wish to disclose their care history. Identifying care history from other sources is also currently difficult in Scotland. There is no national, central record of children who have been looked after. Data on children going through the Children’s Hearing System may potentially be available from the Scottish Children's Reporter Administration (subject to permission), but this would not cover all CEYP. Checking the care history of all cases and controls against social care data held by all 32 local authorities in Scotland would be possible but logistically difficult and time consuming. Checking care history against the nationally collated Children Looked After Survey (CLAS) annual return data would however be possible. Since 2007/08, CLAS annual returns have involved all Scottish local authorities submitting individual level data to the Scottish Government on all children looked after during the preceding year (Clark, et al., 2017). This is a potentially very useful research resource for identifying care experience as CLAS data from one year can be linked to data in subsequent returns, which over time helps build an increasingly complete picture of care experience among the Scottish population. However, at the time this study was developed, insufficient individual level CLAS data was available. A case-control study was therefore deemed not feasible.

4.3.4 Data linkage approach

After consideration of alternative study designs, a data linkage approach was chosen as it offers the following advantages:

- *Reducing the effects of non-participation:* The data linkage study described in Chapter 5 uses existing social care data from Fife Council to identify CEYP and existing NHS data to identify teenage pregnancy outcomes. Importantly, it does not rely on approaching participants to obtain individual consent. This approach allows all eligible participants to be included in the study, reducing the potential for response bias. From a service planning and public health perspective it is important that the study represents all CEYP in Fife, not just those who would actively engage in research. Being able to include all those in the target population is therefore a significant methodological advantage and is one of the main reasons a data linkage approach was chosen.
- *Reducing losses to follow-up:* The data linkage study uses routinely collected NHS data to determine teenage pregnancy outcomes. This reduces the potential for bias due to losses to follow-up as outcome data is available without the need to contact participants.
- *Quality of care exposure data:* The study uses administrative social care data from Fife Council to identify the care history of those who have been looked after. For those with a complex care history, involving multiple placements and care episodes, the administrative records held by the Council are likely to be more reliable than self-reported or carer reported data, for example for determining the total duration in care or the total number of placements.
- *Quality of the outcome data:* The data linkage study uses national, routinely collected maternity and hospital data which is generally considered to be of high quality (Information Services Division, 2010b; 2019a; NHS National Services Scotland, 2019). It is likely to be more complete than self-reported pregnancy data, which may be underreported due to poor memory recall or social desirability, particularly for highly sensitive outcomes such as induced abortions (Kelly, et al., 1997).

- *Cost and speed:* Data linkage studies are potentially cheaper and quicker to undertake than other study types since they use data that has already been collected for other purposes.
- *Contributing to data linkage knowledge in Scotland:* Cross-sectoral data linkage is still a relatively new approach for examining health outcomes for CEYP in Scotland. A data linkage approach was partly chosen as the lessons learnt will contribute to the growing evidence-base for cross-sectoral data linkage in Scotland.

There are however several disadvantages to the data linkage approach. Firstly, it is limited by the data sources it links (e.g. the Council administrative data describes placement types and duration but does not cover other aspects such as placement quality). Secondly, the data linkage process itself may be problematic (e.g. if the linkage is incomplete and those whose data is linked differ from those whose data is not). Most importantly, it is not able to consider CEYP's views. Despite these limitations, it was felt that a data linkage approach offered the best balance of methodological rigour and use of resources to answer the question posed.

4.4 Extending the data linkage approach to other CEYP health outcomes

Despite its many advantages, data linkage is not without its challenges. The study objectives are described in full in Chapter 5 but one objective was to determine whether the data linkage approach used could potentially be extended to examine other health outcomes of interest for CEYP in Fife.

Teenage pregnancy is just one of several adulthood health outcomes that Fife Corporate Parent Board wish to identify for CEYP in Fife. Others include mental health outcomes, alcohol and substance misuse, long term chronic conditions and patterns of service use among care leavers to assess whether CEYP access the services they need. Given the potential complexity of the data linkage process, however, it seemed prudent to 'test' the data linkage process on a single health outcome first. Teenage pregnancy was chosen as the 'test outcome' because:

- It can be clearly defined.

- High quality outcome data is available from routine NHS data.
- It is of immediate relevance to NHS Fife, due to the high levels of teenage pregnancy generally in Fife.
- It helps fill a wider identified research gap in our knowledge of teenage pregnancy risk among CEYP in Scotland and the UK more generally.

It was hoped that, if successful, a similar data linkage approach could be used to examine other adulthood health outcomes. Learning from the data linkage process is therefore a key part of determining whether this type of cross-sectoral data linkage is a feasible method for identifying other adulthood health outcomes for CEYP in Fife. In practice, there were considerable challenges in undertaking the data linkage, both in securing the permissions required for the data linkage and in overcoming several logistical challenges in extracting and linking the required data. The challenges faced and lessons learnt are described in Chapter 8.

Chapter 5: Data linkage study methods

5.1 Introduction

This chapter describes the methods of a cross-sectoral data linkage study linking social care data for children looked after by Fife Council between October 1991 and March 2015 with routinely collected NHS data to identify teenage pregnancy outcomes for CEYP in Fife, compared with a group of non-care experienced peers from a similar socioeconomic background.

5.2 Aim

The aim of the study was to use data linkage techniques to compare teenage pregnancy rates and outcomes among CEYP in Fife with that of their non-care experienced but similarly deprived peers.

5.3 Objectives

The primary objectives were to determine the:

1. Proportion of CEYP in Fife who experienced a live birth before the age of 20 years, compared with that of their non-care experienced but similarly deprived peers; and
2. Proportion of CEYP in Fife who experienced a termination of pregnancy before the age of 20 years, compared with that of their non-care experienced but similarly deprived peers.

Secondary objectives were to:

3. Determine whether CEYP in Fife were more (or less) likely to continue with a teenage pregnancy to delivery than their non-care experienced but similarly deprived peers;
4. Compare the antenatal behaviours and postnatal outcomes for CEYP in Fife with that of their non-care experienced but similarly deprived peers; and
5. Determine whether the data linkage approach used in the study is a useful approach that could be extended to examine other health outcomes of interest for CEYP in Fife.

Due to time constraints resulting from national COVID-19 restrictions (described in Section 8.2.4) the analysis of objectives one and two was prioritised. Objective five is also considered.

5.4 Ethical and other research governance approvals

Ethical approval was received from the NHS Scotland East of Scotland Research Ethics Service (15/ES/0108, Appendix 8) and the University of St Andrews University Teaching and Research Ethics Committee (MD12251, Appendix 9).

Local management and NHS Research and Development approval was obtained from NHS Fife (17-070 141029 15/ES/0108, Appendix 10). Approval was also obtained from the NHS Scotland Public Benefit and Privacy Panel for Health and Social Care (1516-0044, Appendix 11) and from Fife Council.

The following legal data agreements were put in place to allow the use of the social care data from Fife Council: Data Sharing Agreement between Fife Council and the University of St Andrews; Data Processing Agreement between Fife Council and National Records of Scotland (NRS); and Data Processing Agreement between Fife Council and NHS National Services Scotland. Obtaining the data agreements required for the study was a lengthy process, as described in Section 8.2.2.

Importantly, the permissions granted allowed the use of patient identifiable data without individual consent.

5.5 Overview of methods

The study involved identifying and comparing teenage pregnancy outcomes for females in two different groups or ‘cohorts’ as follows:

- *Care experienced cohort*: Females looked after by Fife Council between October 1991 and March 2015; and
- *Non-care experienced but similarly deprived cohort*: Non-looked after females from a similar socioeconomic background to the care experienced cohort (i.e. similarly deprived).

The Community Health Index (CHI) number was identified for individuals in both cohorts and used to extract the relevant outcome data for each individual from national Scottish Morbidity Record (SMR) datasets held by Public Health Scotland. The CHI number is a unique patient identifier used on all an individual's health records across NHS Scotland which can be used to identify the same individual across multiple NHS datasets. The process for identifying the CHI number varied by cohort. For the care experienced cohort, the CHI number was identified using probabilistic matching techniques which are described in Section 5.6.9. For the non-care experienced but similarly deprived cohort the process was simpler as the CHI number was available at the time the cohort was selected.

The study was observational (as no intervention was involved) and retrospective (as all exposures and outcomes had already occurred). While the data linkage study does not correspond to a specific traditional study design it contains elements of a retrospective cohort study where care experience is the exposure of interest and teenage pregnancy the outcome of interest (Figure 5.1).

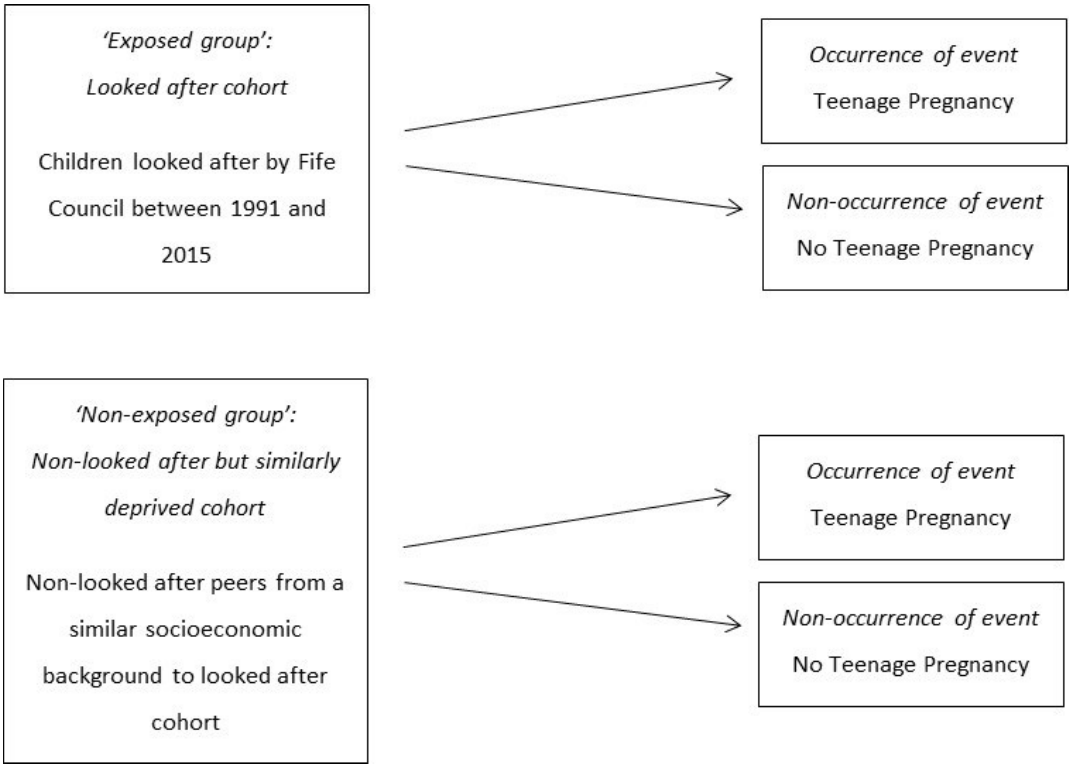

Figure 5.1: Relationship of exposure to outcome occurrence in the data linkage study

The quality of a data linkage study depends both on the sources of data linked and the process used to link them. These elements are now described in more detail.

5.6 Care experienced cohort

5.6.1 Inclusion criteria

The care experienced cohort consisted of all female children and young people looked after by Fife council at any point between 1st October 1991 and 31st March 2015, who were aged 16 years or over on 31st March 2015.

Females were included regardless of the length of time spent in care, type of placement and discharge destination (e.g. returning home, ageing out of care or being adopted).

The start date of October 1991 was chosen for practical reasons as the Social Work Information System (SWIS) database (which was used to identify some of the looked after cohort) was introduced in October 1991. No electronic records were available before October 1991 and so the identification of children who were looked after before this date was impractical.

5.6.2 Exclusion criteria

Although teenage parenthood among male CEYP is an important issue, males were excluded from the study due to the difficulty of identifying young fathers using routine data.

Children in care for respite care purposes only (e.g. children with severe disabilities who received short episodes of respite care to help their carers) were excluded.

5.6.3 Identification

The care experienced cohort was identified from two existing administrative databases held by Fife Council Social Work Department:

- the SWIS database (which covered all children looked after by Fife Council between 1991 to 2004); and

- the Social Work Information Technology (SWIFT) database (which covers all children looked after by Fife council 2004 to present).

The SWIS and SWIFT databases were/are used by Fife Council for administrative purposes such as logging the type and dates of every care placement and recording the legal statutes in place for each looked after child. As such they are thought to be very reliable in terms of including all children looked after by Fife Council. Of note, the information held in SWIS and SWIFT is not the child’s full social care record, only an administrative summary.

5.6.4 Sample size

The care experienced cohort included all those eligible and consisted of 1119 females.

5.6.5 Data extraction

Data were extracted from SWIS and SWIFT by the author and Fife Council staff. Data extraction was partly electronic and partly manual.

The SWIS database was a historic database that was no longer used by social care staff. During the early planning stages of the study it became apparent that the SWIS database was due to be decommissioned in January 2014, after which only paper records would be available. Fortunately, a long serving member of staff with experience of using the database was able to automatically extract part of the data required for the study and transfer it to an Excel spreadsheet. The remainder of the data required from SWIS were then manually extracted by the author and added to the Excel spreadsheet, ahead of the decommissioning of the database. The manual extraction was a time-consuming process.

In contrast, data within the SWIFT database were much more accessible and the data required were readily extracted automatically by an experienced member of Council staff.

The number of individuals identified from each database is shown in Table 5.1. Some of the cohort appeared in both SWIS and SWIFT as both databases were used concurrently for a period during the transition from SWIS to SWIFT.

Table 5.1: Source of social care data for care experienced cohort (n=1119)

Social work database	Number	Percentage of cohort
SWIS only	719	64%
SWIFT only	321	29%
Both SWIS and SWIFT	79	7%
Total	1119	100%

5.6.6 Data cleaning

Once extracted, the SWIS and SWIFT data were cleaned by the author. This involved:

- Checking entries against the inclusion and exclusion criteria.
- Checking for obvious errors and missing data (e.g. incorrectly formatted data items, invalid dates of birth and missing start or end placement dates).
- Checking errors and missing data items against other data held within SWIS and SWIFT and updating data items where possible.
- Identifying and then combining overlapping data held within both SWIS and SWIFT.
- Combining multiple database entries into a single record per individual.
- Removing unnecessary identifiable data from data fields.
- Deriving variables (e.g. age at first entry to care and duration in care).
- Summarising data (e.g. placement histories).

Data were cleaned by the author on Fife Council premises with the permission of Fife Council.

5.6.7 Demographic and social care placement variables

Two separate datafiles were prepared containing the following data variables:

- *Demographic data:* first name(s), surname, known aliases, sex (all female), date of birth and last known and previous postcodes with end and start dates; and
- *Social care placement variables:* reason for being looked after; type of care placement; placement dates; length of placement; whether the placement was a first or subsequent placement; discharge destination; age at first entry to care; number of episodes of care; total duration in care; and date of birth.

At the time of the study, the CHI number was recorded within SWIS and SWIFT for only a very small proportion (less than 1%) of CEYP. The demographic data were therefore needed to match each CEYP to their CHI number using probabilistic matching techniques (described in Section 5.6.9).

Of note, care history data were available for time spent in the care of Fife Council only. Details of care placements under the care of other Councils were not known, although it was known if a young person had transferred into the care of Fife Council from another Council area and whether a young person had transferred out from the care of Fife Council to another Council area.

It was originally intended to extract the pre-care postcode for each CEYP to derive a pre-care deprivation score. However, in practice it was not possible to reliably identify the pre-care postcode from the data available in SWIS and so a pre-care deprivation score was not obtained.

5.6.8 Time required to prepare social care data

The preparation of the social care data was a time-consuming process. For example, manual extraction of the SWIS data took approximately 49 working days. Preparation of the demographic data file took approximately 40 working days while preparation of the social care placement data file took approximately 32 working days. In total, preparation of the social care data therefore took approximately 24 weeks, excluding time spent arranging access, travel time to Council premises and Council staff time to support the work.

5.6.9 CHI seeding

The demographic datafile was securely transferred to NRS, as shown in the data flow diagram in Figure 5.2. The demographic data were then used by NRS to identify the CHI number for each individual using the process of 'probability matching' (Kendrick, 1997).

The probability matching process involved comparing the social care demographic data for each individual (i.e. names including aliases, sex, date of birth and postcodes from SWIS and SWIFT) to demographic data held within the national CHI database and historical NRS records and making a decision as to whether the records compared were likely to belong to the same individual. Comparing data in this way can result in several potential matches. The resulting matches were therefore categorised according to how well a match had been made, and a decision made as to which match categories were considered acceptable. The matching process is described in Appendix 12.

Probabilistic matching to the CHI has been shown to work well in other Scottish cross-sectoral data linkage studies. For example, in Pell et al. (2012) education data from children who had attended Scottish schools from 2006 to 2011 were linked to maternity data. Even with a limited set of matching variables (pupil date of birth, gender and home postcode but not pupil names) a high level of linkage to an acceptable CHI (93%) was achieved. When forenames and surnames were included as identifiers an acceptable CHI was found for almost all (≥99.9%) of children. However, for the current study, it was thought that linking to the CHI might be more difficult for several reasons related to the nature of the looked after population:

- *Out-of-date postcode data:* The postcode data available in SWIS and SWIFT related to the individual's postcode(s) during and prior to care (although more recent postcodes were available for some individuals). Given the historic nature of the care experienced cohort, the last known postcode for many was expected to be out of date. As the CHI database holds the current postcode and limited historical postcodes (rather than a full list of previous postcodes), it was anticipated that matching the social care postcode data to CHI records would be more difficult. It was therefore agreed that a list all known postcodes for the

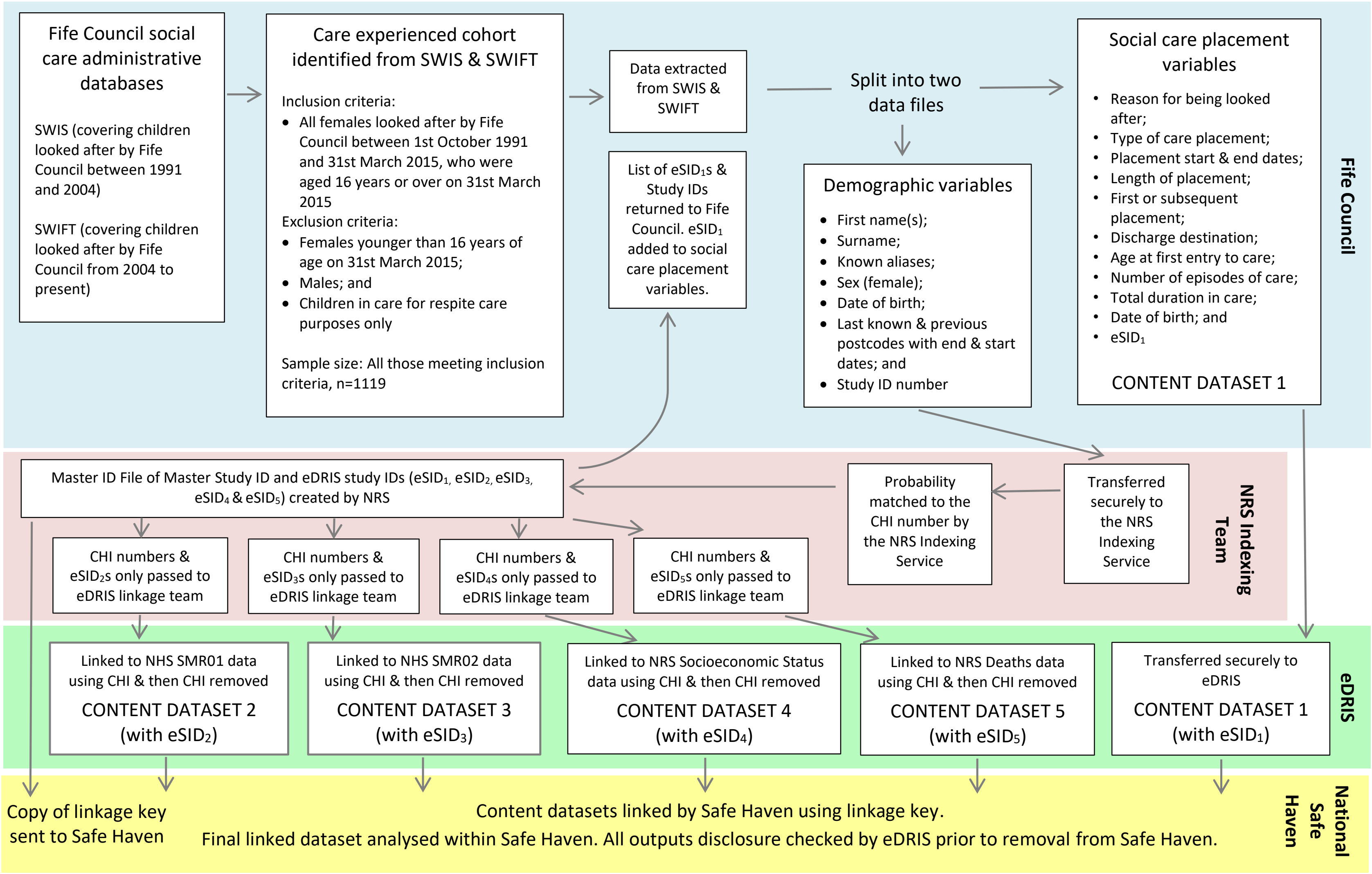

Figure 5.2: Care experienced cohort data flow

care experienced cohort would be provided and that the postcodes for the care experienced cohort would be checked against historical tables of postcodes from the NHS Central Register held by NRS to try to improve the matching rate.

- *Aliases:* Children in care sometimes change their name, either formally or informally. All known aliases recorded in SWIS and SWIFT were therefore included in the demographic data file and taken into account in the matching process.
- *Adoption:* The CHI number for children who are adopted remains the same but their name will change as part of the legal adoption process, making it difficult to match the 'old' pre-adoption name held within SWIS and SWIFT to the newer post-adoption name held within the CHI database. It was therefore agreed that names for the care experienced cohort would be checked against historical tables of names from the NHS Central Register held by NRS to try to improve the matching rate for those who were adopted.

The following data were transferred to NRS for the CHI probabilistic matching process:

- Forename, surname, gender and date of birth for all 1119 (100%) of the cohort;
- At least one postcode for 1117 (99.8%) of the cohort. The number of postcodes ranged from zero to over 40 (with a mean of five and a median of three);
- At least one known alternative forename for 122 (11%) of the cohort; and
- At least one known alternative surname for 281 (25%) of the cohort.

5.6.10 CHI Indexing

Having identified the CHI number, a set of study IDs ($eSID_1$ to $eSID_5$) and a linkage key were created by NRS to allow the different content datasets created during the study to be linked at a later date in the Safe Haven, without the need for the CHI number (Figure 5.2). Copies of the $eSID_1$s were returned to Fife Council and added to the social care placement data file (Figure 5.2). The social care placement datafile was then transferred securely to eDRIS and linked to the other content datasets in the Safe Haven using the linkage key.

5.6.11 Identifying socioeconomic status at time of birth

For those who could be matched to a CHI number, parental social class and the Carstairs deprivation index quintile at the time of the individual's birth were obtained from NRS Births Registration data, to use in the matching of the non-care experienced but similarly deprived cohort (described in Section 5.7.3).

5.6.12 Processes to safeguard data

Managing the study data appropriately to minimise the infringement of confidentiality wherever possible (Medical Research Council, 2003) was an important part of the study. Processes used to ensure the safe conduct of the study included:

- *Use of the electronic Data Research and Innovation Service (eDRIS)*: eDRIS is part of Public Health Scotland. It supports researchers with data linkage by assisting with study design, approvals and data access via a secure analytical environment (Public Health Scotland, 2020b). eDRIS has been designed on best practice principles for data linkage research, helping ensure data security and confidentiality of data linkage research, thereby overcoming many of the data privacy concerns that data linkage can raise.
- *Separation of the social care data into two datafiles*: The social care data were separated into two different datafiles to minimise unnecessary access to the data since the CHI seeding by NRS required only the demographic details but not the social care placement data and, similarly, analysis of the social care data in the final linked dataset in the Safe Haven required the placement variables but not individuals' names or postcodes.
- *Secure transfer of data*: The social care data for the study were transferred from Fife Council using Secure File Transfer Protocols. The data transfer was overseen by the study's eDRIS research coordinator to ensure the correct processes were followed.
- *Separation of indexing and linkage functions*: The indexing and linkage roles were separated to minimise the transfer of personal identifiers, with no one person having access to all the study data. For example, once the CHI numbers were identified by NRS the personal identifiers used in the CHI seeding were removed and only the CHI numbers and eSIDs (eSID$_2$ to eSID$_5$) passed to

eDRIS for the outcome data extraction (Figure 5.2). Similarly, once eDRIS had used the CHI number to extract the relevant outcome data, the CHI numbers were removed so that the final linked dataset did not contain any CHI numbers. Linkage of the various datasets within the Safe Haven was instead undertaken by a linkage agent using the linkage key created by NRS earlier in the linkage process.

- *Use of the National Safe Haven*: Analysis of the final liked dataset was undertaken within the National Safe Haven, with statistical disclosure checking of all statistical outputs by eDRIS before their removal from the Safe Haven. The purpose of the statistical disclosure checks was to ensure that the statistical outputs removed did not include any potentially disclosive data (such as cells with small numbers or data relating to small populations) which could be used either on its own or in conjunction with other data to breach an individual's privacy (Public Health Scotland, 2020c).
- *Information governance training*: Safe researcher training was undertaken by the author. An eDRIS User Agreement was also signed before access was granted to data in the Safe Haven.

5.7 Non-care experienced but similarly deprived cohort

5.7.1 Purpose of cohort

As discussed in Section 2.12.3, being looked after and teenage pregnancy are both associated with socioeconomic deprivation. One would therefore expect to see higher teenage pregnancy rates among CEYP compared with the general population, regardless of whether care experience is associated with an increased risk of teenage pregnancy. However, existing UK studies of teenage pregnancy among CEYP have so far not sufficiently compared teenage pregnancy rates among CEYP with non-care experienced young people from a similar socioeconomic background. This study therefore compared teenage pregnancy rates and outcomes among the care experienced group with outcomes for a group of young people from a similar socioeconomic background to the care experienced cohort who were known not to have been looked after.

5.7.2 Inclusion criteria

It was intended that the non-care experienced but similarly deprived cohort would consist of females aged 16 years or over on 31st March 2015 registered on the CHI database who:

- were born in Fife; AND
- remained resident within Fife until at least age 16 years; AND
- were known not to have been in the care of Fife Council during the study period of 1st October 1991 and 31st March 2015.

In practice, the criteria for remaining resident within Fife until at least age 16 was changed to having a Fife postcode in the CHI database at the time the controls were selected in 2019, due to logistical difficulties accessing data on place of residence at age 16.

5.7.3 Matching criteria

The non-care experienced but similarly deprived cohort was matched to the care experienced cohort on variables relating to sex, age and socioeconomic status at birth. The following matching criteria were used:

- *Same sex*: all female;
- *Of a similar age*: matched to calendar year of birth;
- *From a similar social class:* matched by the socioeconomic group of the individual's parent (either father and/or mother, depending on the type of registration) at the time of the individual's birth, using data on socioeconomic group from NRS Birth registration files (Social Class codes for registrations between 1980 and 2000); and
- *From a geographical area with a similar socioeconomic deprivation profile*: matched by the Carstairs deprivation index quintile[14] of the maternal postcode at the time of the individual's birth, with the deprivation quintile derived from

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[14] The Carstairs deprivation index measures material deprivation for small geographical areas (e.g. Scottish postcode sectors). Carstairs scores were first created in 1981 using Census data on car ownership, male unemployment, overcrowding and low social class and are updated every ten years (Brown, et al., 2014). Although the Carstairs deprivation index is constructed differently to the newer and now more commonly used Scottish Index of Multiple Deprivation (SIMD), Carstairs scores have been shown to correlate well with SIMD (Hanlon, et al., 2005). This study used Carstairs rather than SIMD as the Carstairs index is considered more appropriate for studies using pre-2000 data (Information Services Division, 2013).

NRS Births registration postcode data. For those born 1976-1985 the 1981 Carstairs variable was used, for those born 1986-1995 the Carstairs 1991 variable was used and for those born 1996-2005 the Carstairs 2001 variable was used.

5.7.4 Identification

The non-care experienced but similarly deprived cohort was identified by eDRIS using the CHI database and NRS Births registration data on birthplace.

To ensure that the no-one in the non-care experienced cohort had been looked after by Fife Council during the study period, anyone who appeared in the care experienced cohort was removed from the non-care experienced cohort selection. To reduce the likelihood that those in the non-care experienced cohort may have lived outwith Fife and been looked after by other Councils, the selection of the non-care experienced cohort was further restricted to those who were known to have been born in Fife and who were resident in Fife at the time the cohort was selected in 2019.

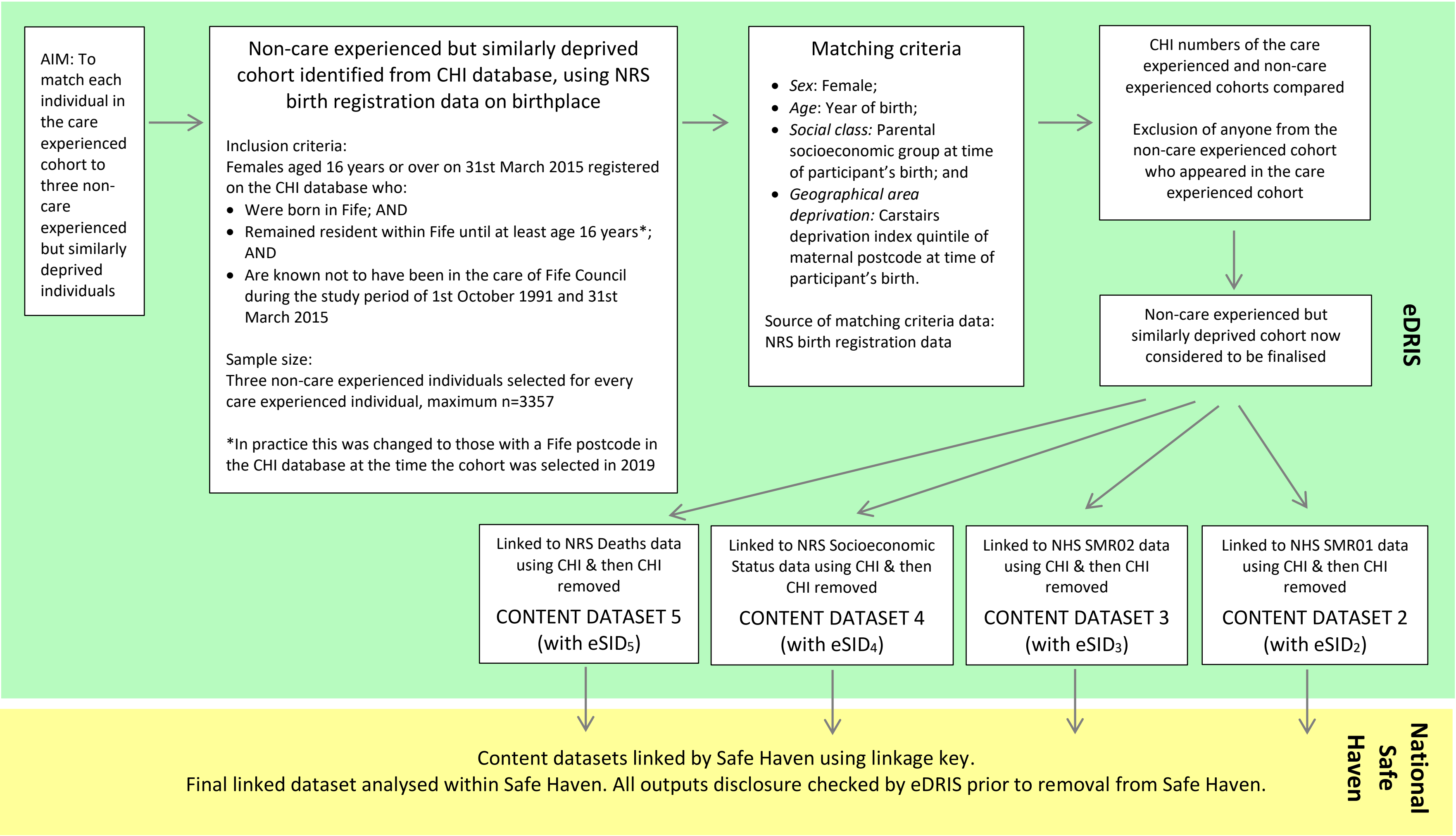
5.7.5 Sample size

Three non-care experienced but similarly deprived individuals were selected for every member of the care-experienced cohort who was successfully matched to a CHI number. The maximum potential size of the non-care experienced but similarly deprived cohort was therefore 3357 (i.e. three times the care experienced cohort size of 1119). In practice, the number of non-care experienced but similarly deprived individuals required was lower, as not everyone in the care experienced cohort could be matched to a CHI number (described further in Chapter 6).

The ratio of three non-care experienced but similarly deprived individuals for every care experienced individual was based on the power calculations described in Section 5.9.

5.7.6 CHI indexing and data flow

Identification of the CHI number for the non-care experienced but similarly deprived cohort was much simpler than that previously described for the care experienced cohort, as the CHI number was available at the point the cohort was identified from the CHI database. The CHI number was then used by eDRIS to identify the outcome data (Figure 5.3). The CHI numbers were then replaced with study IDs ($eSID_2$ to $eSID_5$) and the content datasets were transferred to the Safe Haven and linked using the linkage key.



AIM: To match each individual in the care experienced cohort to three non-care experienced but similarly deprived individuals

Non-care experienced but similarly deprived cohort identified from CHI database, using NRS birth registration data on birthplace

Inclusion criteria:
Females aged 16 years or over on 31st March 2015 registered on the CHI database who:

- Were born in Fife; AND
- Remained resident within Fife until at least age 16 years*; AND
- Are known not to have been in the care of Fife Council during the study period of 1st October 1991 and 31st March 2015

Sample size:
Three non-care experienced individuals selected for every care experienced individual, maximum n=3357

*In practice this was changed to those with a Fife postcode in the CHI database at the time the cohort was selected in 2019

Matching criteria

- *Sex*: Female;
- *Age*: Year of birth;
- *Social class:* Parental socioeconomic group at time of participant's birth; and
- *Geographical area deprivation:* Carstairs deprivation index quintile of maternal postcode at time of participant's birth.

Source of matching criteria data: NRS birth registration data

CHI numbers of the care experienced and non-care experienced cohorts compared

Exclusion of anyone from the non-care experienced cohort who appeared in the care experienced cohort

Non-care experienced but similarly deprived cohort now considered to be finalised

Linked to NRS Deaths data using CHI & then CHI removed
CONTENT DATASET 5 (with eSID$_5$)

Linked to NRS Socioeconomic Status data using CHI & then CHI removed
CONTENT DATASET 4 (with eSID$_4$)

Linked to NHS SMR02 data using CHI & then CHI removed
CONTENT DATASET 3 (with eSID$_3$)

Linked to NHS SMR01 data using CHI & then CHI removed
CONTENT DATASET 2 (with eSID$_2$)

Content datasets linked by Safe Haven using linkage key.
Final linked dataset analysed within Safe Haven. All outputs disclosure checked by eDRIS prior to removal from Safe Haven.

Figure 5.3: Non-care experienced but similarly deprived cohort data flow

5.8 Outcomes

5.8.1 Source of outcome data

The study used maternity and hospital data from the SMR01 (General/Acute Inpatient and Day Cases) and SMR02 (Maternity Inpatient and Day Cases) datasets collected by Public Health Scotland[15]. It also used NRS death registration data, to identify whether participants had died before the age of 20. The outcomes and data sources are summarised in Table 5.2. All participants were at least 20 years of age by the time the outcome data were identified.

Table 5.2: Summary of outcomes and data sources

Category	Data source	Outcome
Live births	SMR02	Live birth under age 20 years
Terminations of pregnancy	SMR01 & SMR02	Termination of pregnancy under age 20 years*
Stillbirths	SMR02	Stillbirth under age 20 years
‘Other’ pregnancy related events	SMR01 & SMR02	Other outcomes which indicate pregnancy (i.e. spontaneous abortion, ectopic pregnancy, hydatidiform mole, missed abortion, blighted ovum and other abnormal products of conception) under age 20 years
Antenatal factors	SMR02	For deliveries under age 20 years: • Estimated age at conception • Estimated gestation at antenatal booking appointment • History of smoking recorded at antenatal booking appointment • History of smoking during pregnancy • Drug misuse during pregnancy, including type of drugs used

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[15] SMR01 is an episode-based database of all inpatients and day cases discharged from non-obstetric and non-psychiatric specialties in NHS Scotland (Public Health Scotland, 2022a). SMR02 is an episode-based database of all inpatients and day cases discharged from Obstetric specialties in NHS Scotland (Public Health Scotland, 2022b).

		• Typical weekly alcohol consumption recorded at antenatal booking appointment • Body Mass Index of woman at antenatal booking appointment
Postnatal factors	SMR02	For deliveries under age 20 years: • Estimated gestation at delivery • Preterm delivery (delivery before 37 weeks gestation) • Mode of delivery • Birthweight of baby • Admission of baby to neonatal unit following delivery
Deaths	NRS Death Registrations	Death before age 20 If death before age 20, age at death
Area-based measure of socioeconomic position at time of hospital admission	SMR01/02	• Carstairs index of deprivation score at time of admission • Scottish Index of Multiple Deprivation (SIMD) score at time of admission

*Age at admission was used as proxy for age at time of event.

Due to time constraints, the analysis presented here focuses on live births and terminations of pregnancy only.

5.8.2 Outcome definitions

The definition of live birth and termination of pregnancy (including the ICD-9 and ICD-10 codes used) are provided in Appendix 13.

5.8.3 Quality of data sources

5.8.3.1 Births

Legally all births in Scotland must be registered by the Registrar of Births, Deaths and Marriages through the civil registration system administered by NRS (Information Services Division, 2019b). NRS births registration data are therefore the most complete record of births in Scotland. However, births data are also collected in SMR02 whenever a mother is discharged from hospital after delivering a baby (Information Services Division, 2019b). Almost all births in Scotland are covered by SMR02, except for home births and births at non-NHS hospitals unless subsequently recorded by an NHS hospital (Information Services Division, 2019a). SMR02 is therefore also a very reliable source of births data. For example, comparison of SMR02 and NRS data for 1985-2019 shows that SMR02 data is available for 97.1% to 99.3% of all live births and 86.3% to 100% of all stillbirths in Scotland, depending on the year considered (Information Services Division, 2019c). SMR02 also has the advantage of providing other useful clinical information that NRS births registration data cannot (Information Services Division, 2019b). SMR02 was therefore used in this study.

5.8.3.2 Terminations of pregnancy

The most complete data for terminations of pregnancy in Scotland are the legal notifications of abortions to the Chief Medical Officer (CMO), as there is a legal requirement to notify the CMO within seven days of a termination (Public Health Scotland, 2021b). However, at the time of the study, CMO abortion data were not available for linkage at an individual level[16]. The study instead used termination of pregnancy data derived from SMR01 and SMR02 returns. SMR data only includes terminations undertaken within Scottish NHS hospitals. However, over 99% of terminations in Scotland are performed in NHS hospitals or clinics, with less than 1% of terminations undertaken privately (Information Services Division, 2015).

Terminations are undertaken surgically or medically, either as an in-patient, day case or outpatient. Early medical terminations are also sometimes now undertaken at home[17]. Terminations undertaken as an in-patient or day case are recorded in SMR01 or SMR02, while those undertaken in outpatients are recorded in SMR00 (Outpatient

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[16] In May 2020 a new Notification of Abortion Statistics system was introduced which now includes the CHI number, allowing linkage of CMO abortion data to other datasets. It includes historic termination records from 2000 and historic records between 2000 and 2020 have been CHI seeded. Records before 2000 have not been CHI seeded, so cannot be used for linkage projects (Public Health Scotland, 2022c).

[17] In October 2017, changes were made in Scotland to allow misoprostol (the second drug used in a medical termination) to be taken at a patient's home. In March 2020, additional changes were made to allow mifepristone (the first drug used in a medical termination) to also be taken at home, where clinically appropriate, to reduce risks associated with COVID-19 (Public Health Scotland, 2021b).

Attendance)[18]. Of note, the current study used termination data from SMR01 and SMR02 only. It did not use data from SMR00 as local checks showed that SMR00 was not used in Fife to record terminations during the time period of interest in the study. The study was also not affected by recent changes during the COVID-19 pandemic which allowed both stages of an early medical termination to be undertaken at home (Public Health Scotland, 2021b), as this change occurred after the study period.

5.8.3.3 Miscarriages

Approximately 11-22% of recognised pregnancies end in miscarriage (Ammon Avalos, Galindo and Li, 2012). Many miscarriages are managed in the community (e.g. within primary care) and hospital based data such as SMR01 and SMR02 will therefore significantly underestimate the proportion of miscarriages. SMR data is therefore not a reliable measure of miscarriages. Having said this, SMR data on miscarriages (as well as other pregnancy related events such as ectopic pregnancy, hydatidiform mole and other abnormal products of conception) were collected in the study for context as they indicate other teenage pregnancies. However, due to the incomplete nature of the spontaneous abortion data and the limited time available for analysis, miscarriages and other pregnancy events such as ectopic pregnancy, hydatidiform mole and other abnormal products of conception were not analysed and are not discussed further.

5.8.3.4 Antenatal and postnatal outcomes

Whilst the quality of SMR02 is generally high, the accuracy of individual data items within SMR02 varies (Information Services Division, 2010b; NHS National Services Scotland, 2019). For example, SMR02 data items on maternal factors such as typical weekly alcohol consumption, drug misuse and body mass index are known to have been poorly recorded in the past (Information Services Division, 2010b). While the recording of these items has now improved (NHS National Services Scotland, 2019), poor historical recording may limit the use and interpretation of these variables for the time period covered by this study. Due to the limited time available for analysis, antenatal and postnatal factors were not analysed and are not discussed further.

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[18] SMR00 records all outpatients (new and follow-up) in specialties other than Accident & Emergency and Genito-Urinary Medicine (Public Health Scotland, 2022d).

5.8.3.5 Deaths

All deaths in the UK must be registered (Office for National Statistics, 2016). The NRS deaths data used in the study is therefore considered to be of high quality.

5.9 Power calculations

Power calculations were undertaken to determine whether the study would have sufficient power to show a teenage pregnancy rate among CEYP that was 25% higher than that of their non-care experienced peers from a similar socioeconomic background (Appendix 14).

The power calculations were undertaken during the planning stages of the study and were based on an estimated care experienced cohort sample size of 838 (i.e. smaller than the final care experienced cohort sample size of 1119) and a conservative CHI linkage rate of 85%. They showed that the study would have at least 90% power to show a teenage pregnancy rate among CEYP that was 25% higher than that of their non-care experienced peers from a similar socioeconomic background, provided a 1:3 ratio of care experienced to non-care experienced but similarly deprived participants was used.

Of note, the power calculations were based on the occurrence of either a termination of pregnancy or a birth. However, terminations of pregnancy and births are presented separately in the results.

5.10 General population comparison

The main comparison in the study was between CEYP and their similarly deprived but non-care experienced peers. However, general population estimates for the main outcomes in the study (i.e. the proportion experiencing a termination of pregnancy by age 20 and the proportion experiencing a live birth by age 20) for the years covered by the study were obtained from Public Health Scotland, to illustrate the broader, general population context for the teenage pregnancy estimates for CEYP. This involved obtaining aggregate outcome data for the general population of females born in Fife in each year from 1976 to 1999, using the same data sources and outcome definitions used for the care experienced and non-care experienced but similarly deprived cohorts.

5.11 Analysis of final linked dataset

Analysis of the final linked dataset was undertaken in the National Safe Haven. Analysis of part of the data was undertaken via remote access to the Safe Haven. However, analysis of the fully linked dataset was undertaken via the physical Safe Haven. Due to the closure of the physical Safe Haven, as a result of national COVID-19 restrictions, the time available for analysis of the final linked dataset was limited. This is discussed further in Section 8.2.4.

Data were cleaned and coded in Excel before being imported into SPSS statistical software, for further coding and analysis. All statistical outputs were disclosure checked by eDRIS before their removal from the Safe Haven.

The final linked dataset will be archived in the National Safe Haven. Further analysis of the dataset may therefore be possible, subject to permissions.

5.12 Use of relative risk versus odds ratio

Both relative risks and odds ratios are presented in Chapter 7 for the main outcomes of teenage live births and terminations of pregnancy. While relative risk (RR) and odds ratio (OR) both measure the association between an exposure and outcome, they are measured differently (Ranganathan, Aggarwal and Pramesh, 2015). Relative risk measures the ratio of the risk of the event in the exposed group (e.g. the care experienced group) versus the risk of the event in the non-exposed group (e.g. the non-care experienced group). However, the odds ratio measures the ratio of odds of the event in one group versus the other group. When an outcome is rare (e.g. less than 10%) the values of the odds ratio and relative risk will be similar and so can be used interchangeably (Ranganathan, Aggarwal and Pramesh, 2015, p.224). As an outcome becomes more common, however, the odds ratio and relative risk values diverge, with the odds ratio exaggerating the relationship between the exposure and outcome, and so they cannot be used interchangeably. Therefore, for common outcomes (such as some of the outcomes presented in Chapter 7) the relative risk is the more appropriate measure to use. Relative risks also have the advantage that they can be easier to understand than odds ratios which makes them more useful for dissemination purposes (Cook and Sheikh, 2000). Having said this, Chapter 7 presents odds ratios as well as relative risks, as the presentation of odds ratios allows easier comparison of the study's results with those of the previously published international literature in the systematic review in Chapter 3 (where odds ratios were used in logistic regression, for example).

5.13 RECORD statement

The REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) Statement (Benchimol, et al., 2015) for the study is provided in Appendix 15.

5.14 Discussion of methods

Discussion of the methods is provided in Chapter 9.

Chapter 6: Results Part 1 - Matching rates and comparison of those who were matched with those who were not

6.1 Overview

This chapter presents the CHI matching rate for the care experienced cohort. It then presents the proportion of CEYP with an acceptable CHI number who were fully matched to non-CEYP in the comparison group and compares the care characteristics of CEYP who were fully matched with those who were not. Finally, it compares the baseline matching characteristics of the care experienced and non-care experienced groups to assess how closely matched they were.

6.2 CHI matching rate for care experienced cohort

An acceptable match to a CHI number was achieved for 1013 of the 1119 (90.5%) CEYP in the care experienced group (Figure 6.1). It was not possible to find an acceptable CHI match for 106 (9.5%) of the care experienced group.

6.3 Matching of CEYP to non-CEYP

Of the 1013 CEYP who were matched to an acceptable CHI number:

- A full match to three non-care experienced but similarly deprived young people in the comparison group was achieved for 889 CEYP (Figure 6.1). Three non-CEYP were however subsequently excluded due to death before the age of 20 years. 889 CEYP were therefore matched to 2664 non-CEYP, with each CEYP matched to at least two non-CEYP;
- Not all CEYP could be traced in NRS Births registration data (which was required in order to identify parental social class) and so could not be fully matched. However, for 113 of the CEYP who could not be fully matched, it was possible to achieve a partial match to non-CEYP in the comparison group by limiting the matching criteria to sex (i.e. female), year of birth and maternal Carstairs deprivation index quintile at the time of the participants' birth but not parental social class, with the Carstairs deprivation index quintile identified instead using the first postcode available in the CHI Residential Events Database. This partially matched group was not analysed but could

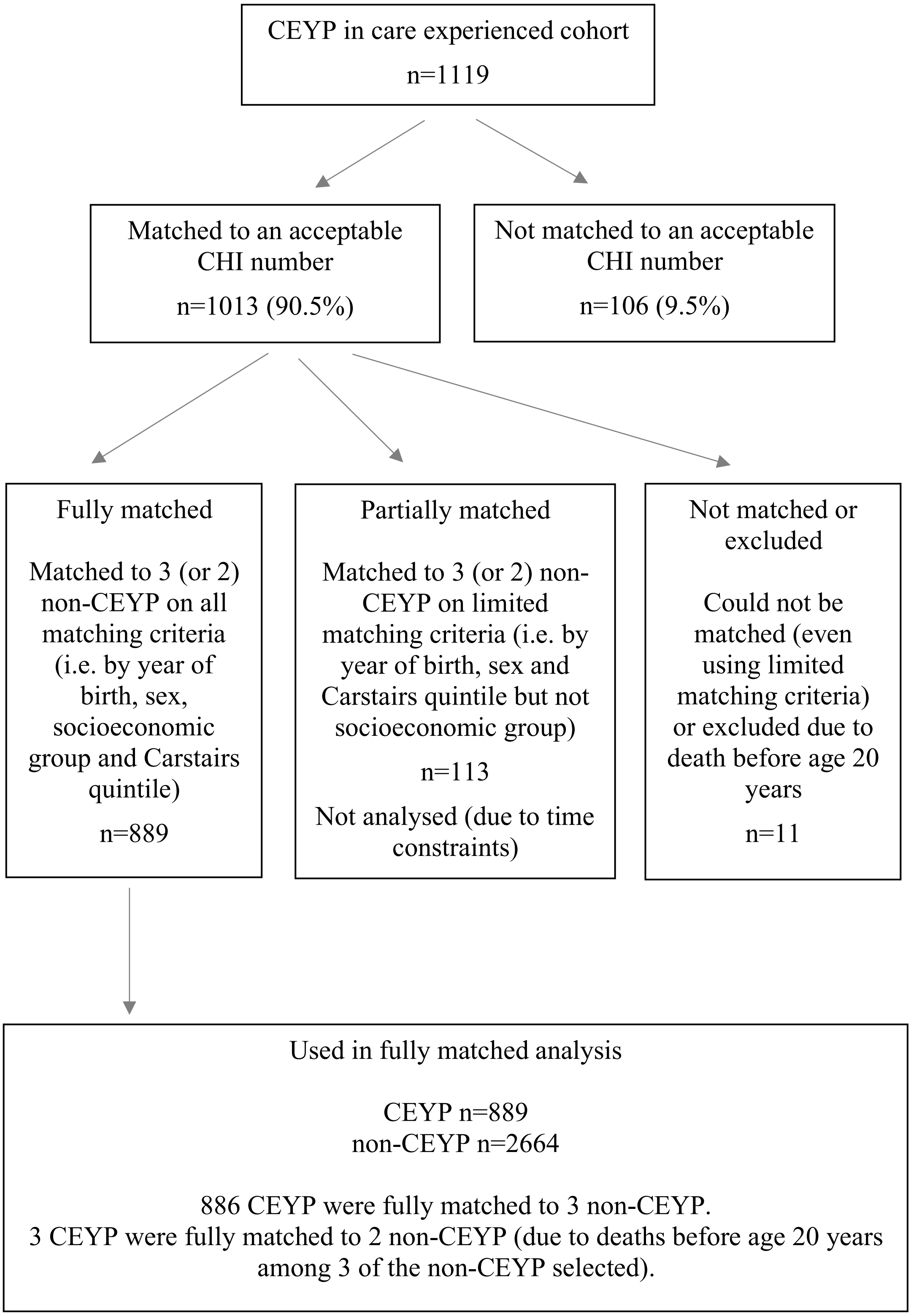


Figure 6.1: Flow diagram showing the number of CEYP matched to an acceptable CHI number and then fully matched to non-CEYP in the comparator group

potentially form the basis for a future sensitivity analysis; and

- No match was possible for 11 CEYP, either because they could not be matched even using the limited matching criteria or because they were excluded due to death before the age of 20 years.

6.4 Comparison of CEYP who were fully matched with those who were not

The care placement characteristics of the 1119 CEYP in the care experienced cohort are summarised in Table 6.1:

- Approximately half (49.4%) entered care for the first time aged 13 years or over.
- Almost one third (32.2%) spent less than 12 months in care, whilst approximately one in seven (15.2%) spent at least five years in care.
- While most CEYP experienced only one episode in care (82.5%), one in six (17.5%) experienced two or more episodes in care. The majority of CEYP experienced only one or two care placements (65.8%), but just over one third (34.2%) experienced three or more care placements.
- Over a quarter (26.2%) were looked after at home only with no other placement type experienced. Just over half (52.3%) were placed in kinship and/or foster care but were never placed in residential care (they may or may not also have had a placement at home). Approximately one fifth (21.5%) were placed in residential care for either all or part of their time in care.

Table 6.1 also compares the care characteristics of CEYP who were fully matched with those who could not be fully matched, to investigate whether the CEYP who were fully matched (and to whom the analysis in Chapter 7 relates) are likely to be representative of the original population of 1119 CEYP. The only statistically significant differences observed between those who were fully matched and those who were not were in relation to year of birth and total duration in care. The fully matched group were less likely to have been born before 1985 and more likely to have been born between 1995 and 1999 than those who were not fully matched. The fully matched group were also less likely to have been in care for less than 12 months and more likely to have been in care for five years or more than those who were not fully matched. Overall, however, the comparison suggests that CEYP who were fully matched are broadly representative

Table 6.1: Care characteristics of all CEYP in care experienced cohort (n=1119) and comparison of CEYP who were fully matched (n=889) with CEYP who were not (n=230)

	All CEYP in the care experienced group n=1119		Matched to an acceptable CHI number and then fully matched to non-CEYP in the comparator group				Statistical significance of difference between matched and not matched groups*
			Yes n=889		No n=230		
	n	%	n	%	n	%	
Year of birth							
Pre-1985	226	20.2%	156	17.5%	70	30.4%	p<0.001
1985 to 1989	203	18.1%	165	18.6%	38	16.5%	
1990 to 1994	316	28.2%	254	28.6%	62	27.0%	
1995 to 1999	374	33.4%	314	35.3%	60	26.1%	
Age at first entry to care							
Under 5 years	177	15.8%	141	15.9%	36	15.7%	p=0.939
5 to 12 years	389	34.8%	311	35.0%	78	33.9%	
13 years or over	553	49.4%	437	49.2%	116	50.4%	
Total duration in care†							
<12 months	360	32.2%	269	30.3%	91	39.6%	p<0.01
12-23 months	249	22.3%	198	22.3%	51	22.2%	
24-59 months	340	30.4%	270	30.4%	70	30.4%	
60 months or over	170	15.2%	152	17.1%	18	7.8%	
Number of care episodes							
1	923	82.5%	729	82.0%	194	84.3%	p=0.404
2 or more	196	17.5%	160	18.0%	36	15.7%	
Number of care placements							
1	507	45.3%	399	44.9%	108	47.0%	p=0.851
2	229	20.5%	183	20.6%	46	20.0%	
3 or more	383	34.2%	307	34.5%	76	33.0%	
First care placement type							
At home	427	38.2%	345	38.8%	82	35.7%	p=0.532
Kinship care	170	15.2%	139	15.6%	31	13.5%	
Foster care	454	40.6%	353	39.7%	101	43.9%	
Residential care	68	6.1%	52	5.8%	16	7.0%	
Ever in out-of-home care							
Yes	826	73.8%	656	73.8%	170	73.9%	p=0.970
No	293	26.2%	233	26.2%	60	26.1%	
Ever placed in residential care							
Yes	241	21.5%	194	21.8%	47	20.4%	p=0.648
No	878	78.5%	695	78.2%	183	79.6%	
Care history summary							
At home only	293	26.2%	233	26.2%	60	26.1%	p=0.885
Placed in kinship and/or foster care but never placed in residential care‡	585	52.3%	462	52.0%	123	53.5%	
Ever placed in residential care§	241	21.5%	194	21.8%	47	20.4%	

*Pearson Chi-Square, two-sided test. †Episode date data was partially missing for 8 CEYP (7 fully matched CEYP and 1 not fully matched CEYP), for whom total duration in care was estimated using partially known date data but this will have underestimated the total duration in care. ‡May or may not also have been looked after at home. §Placed in residential care for either all or part of time spent in care, regardless of whether also spent time in other placement types.

of the original care experienced population, at least for the care characteristics considered in Table 6.1.

6.5 Baseline matching characteristics

6.5.1 Overview

The baseline matching characteristics of the fully matched care experienced and non-care experienced groups were compared to assess how similar the two groups were for the matching variables of: year of birth; maternal Carstairs deprivation index quintile at the time of the participants' birth; and parental socioeconomic group at the time of the participants' birth.

6.5.2 Year of birth

All matches were made using the exact year of birth.

6.5.3 Carstairs deprivation index quintile

The two groups were very similar in relation to the maternal Carstairs deprivation index quintile at the time of the participants' birth (Appendix 16). 49.3% of the care experienced group were from either quintile four or five (Figure 6.2).

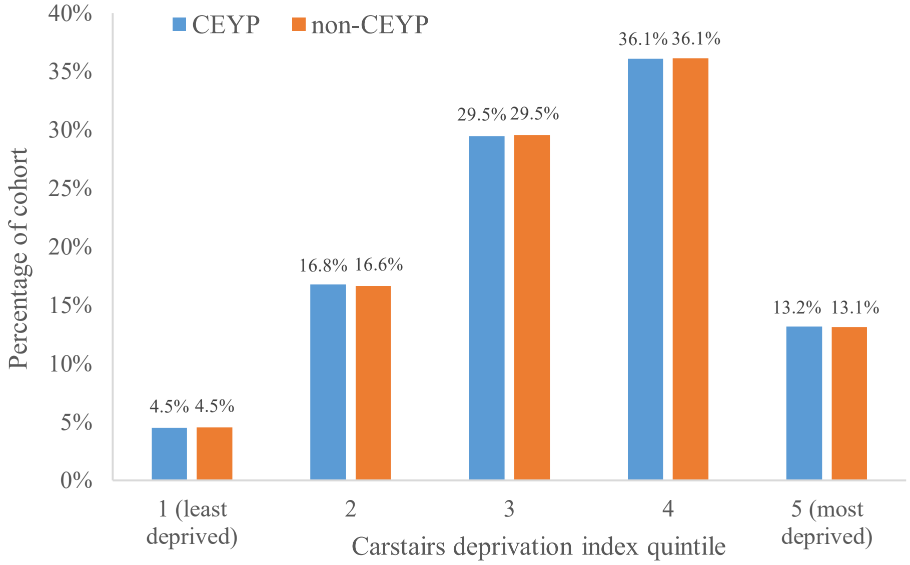
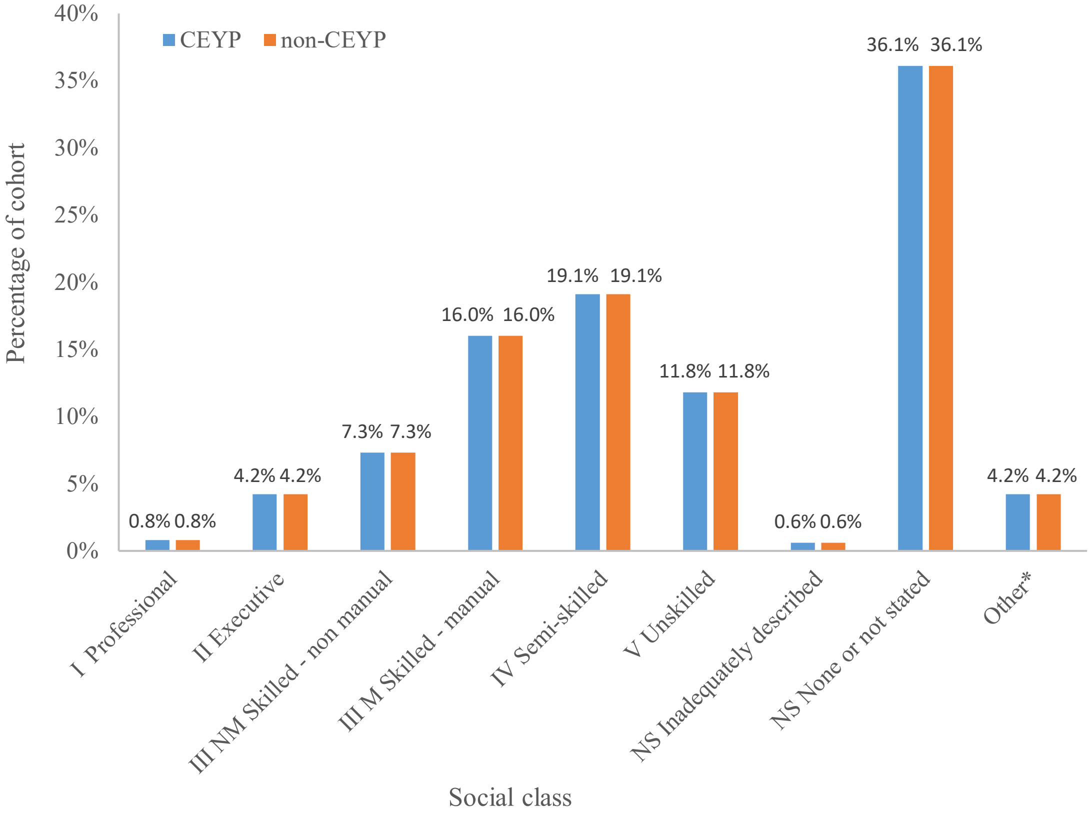


Figure 6.2: Carstairs deprivation index quintile of maternal postcode at time of participants' birth, for fully matched CEYP (n=889) and fully matched non-CEYP (n=2664)

6.5.4 Parental socioeconomic group

The two groups were also very similar for parental social class (Figure 6.3), although a large proportion (36.6%) were coded as "Inadequately described" or "None or not stated" (Appendix 16).



*'Other' includes those born before 1980, for whom a different social class coding system was used. Further breakdown of the 'other' category is not presented due to small numbers. However, all CEYP born before 1980 were exactly matched on socioeconomic group to non-CEYP in the comparison group.

Figure 6.3: Parental social class at time of participants' birth, for fully matched CEYP (n=889) and fully matched non-CEYP (n=2664)

Chapter 7: Results Part 2 - Teenage pregnancy outcomes

7.1 Overview

This chapter presents the results for the study's two main objectives. Firstly, it compares the proportion of CEYP in Fife who experienced a live birth before the age of 20 years with that of their non-care experienced but similarly deprived peers. Secondly, it compares the proportion of CEYP in Fife who experienced a termination of pregnancy before the age of 20 years with that of their non-care experienced but similarly deprived peers. It sets these outcomes in the broader context of the general population. It also compares the relative risk and odds of live birth and termination of pregnancy before age 20 for CEYP compared with their non-care experienced peers and the mean age at first live birth and termination under age 20.

7.2 Live birth before age 20

7.2.1 Proportion experiencing a live birth before age 20

CEYP were significantly more likely to have a live birth before age 20 than their non-care experienced but similarly deprived peers, with 38.4% of CEYP having a live birth before age 20 compared with 16.5% of non-CEYP (Table 7.1). CEYP were also significantly more likely than non-CEYP to have a live birth before age 16 (3.3% versus 0.6%, $p<0.001$) and before age 18 (18.7% versus 5.8%, $p<0.001$).

The proportion of CEYP experiencing a live birth before age 20 was considerably higher than that observed in the general population. Among women in the general population who were born in Fife from 1976 to 1999, the proportion who experienced a live birth before age 20 years ranged from 6.2% (95% CI 5.1 to 7.3%) to 13.3% (95% CI 11.8 to 14.7%), depending on the birth year considered (Appendix 17). When the general population estimates for those born in each year from 1976 to 1999 were weighted to match the birth year profile of the 889 fully matched CEYP in the fully matched analysis, the expected proportion of women having a live birth before age 20 that would have been observed in the general population was estimated to be 10.2%.

Table 7.1: Proportion experiencing a live birth before age 16, 18 and 20 years, for fully matched CEYP (n=889) compared with fully matched non-CEYP (n=2664)

	CEYP (n=889)			non-CEYP (n=2664)			Statistical significance of difference between groups*
	number	%	95% CI	number	%	95% CI	
Live birth before age 16	29	3.3%	2.2-4.7%	15	0.6%	0.3-0.9%	p<0.001
Live birth before age 18	166	18.7%	16.2-21.4%	155	5.8%	5.0-6.8%	p<0.001
Live birth before age 20	341	38.4%	35.1-41.6%	440	16.5%	15.1-18.0%	p<0.001

CEYP (care experienced young people); CI (confidence interval); non-CEYP (non-care experienced young people). *Pearson Chi-Square, two-sided test.

7.2.2 Relative risk of experiencing a live birth before age 20

The relative risk of experiencing a live birth before age 16, 18 and 20 years for CEYP compared with non-CEYP is shown in Table 7.2.

CEYP were more than twice as likely as non-CEYP to experience a live birth before age 20 (RR 2.32, 95% CI 2.06 to 2.62) and more than three times as likely as non-CEYP to experience a live birth before age 18 (RR 3.21, 95% CI 2.61 to 3.94). CEYP were more than five times as likely as non-CEYP to experience a live birth before age 16 (RR 5.79, 95% CI 3.12 to 10.76). However, the confidence interval for the estimate of live birth before age 16 was wide and should be interpreted cautiously.

Table 7.2: Relative risk and odds of experiencing a live birth before age 16, 18 and 20 years for fully matched CEYP (n=889) compared with fully matched non-CEYP (n=2664)

Outcome	Proportion with outcome		RR (with 95% CI)	Unadjusted OR (with 95% CI)	Adjusted OR (with 95% CI)*
	CEYP	non-CEYP			
Live birth before age 16	29/889	15/2664	5.79 (3.12-10.76)	5.96 (3.18-11.16)	6.05 (3.22-11.37)
Live birth before age 18	166/889	155/2664	3.21 (2.61-3.94)	3.72 (2.94-4.70)	3.83 (3.02-4.86)
Live birth before age 20	341/889	440/2664	2.32 (2.06-2.62)	3.15 (2.66-3.73)	3.29 (2.77-3.92)

CEYP (care experienced young people); CI (confidence interval); OR (odds ratio); non-CEYP (non-care experienced young people); RR (relative risk). *Adjusted for all matching variables (i.e. parental socioeconomic group at time of participants' birth; Carstairs deprivation index quintile of maternal postcode at time of participants' birth; and year of birth).

7.2.3 Odds of experiencing a live birth before age 20

The odds of experiencing a live birth before age 16, 18 and 20 years for CEYP compared with non-CEYP are shown in Table 7.2.

The unadjusted odds of having a live birth before age 20 were three times higher among CEYP than non-CEYP (OR 3.15, 95% CI 2.66 to 3.73). The unadjusted odds of having a live birth before age 18 were also three times higher among CEYP than non-CEYP (OR 3.72, 95% CI 2.94 to 4.70). For live birth before age 16, the unadjusted odds were almost 6 times higher among CEYP than non-CEYP (OR 5.96, 95% 3.18 to 11.16) but the confidence interval for the odds ratio was wide and so should be interpreted cautiously.

Table 7.2 also shows the odds of live birth adjusted for potential differences in the matching variables between the CEYP and non-CEYP groups. However, as expected, due to the similarities in baseline matching variables between the care experienced and non-care experienced groups (Section 6.5), adjusting for the matching variables made little difference to the adjusted odds observed. The unadjusted odds are therefore used hereafter for simplicity.

7.2.4 Mean age at first live birth

Among those who had a live birth before age 20, the mean age at first live birth was lower among CEYP than non-CEYP (Table 7.3). CEYP were, on average, five months younger than their non-care experienced but similarly deprived peers at the time of their first live birth (mean difference -0.44 years, 95% CI -0.61 to -0.26).

Table 7.3: If had a live birth before age 20 years mean age at first live birth, among fully matched CEYP (n=889) and fully matched non-CEYP (n=2664)

CEYP			non-CEYP				
Number	Mean age	Standard deviation	Number	Mean age	Standard deviation	Mean difference (95% CI)	Statistical significance of difference between groups*
341	17.94 years	1.26	440	18.38 years	1.17	-0.44 years (-0.61 to -0.26)	p<0.001

CEYP (care experienced young people); CI (confidence interval); non-CEYP (non-care experienced young people). *Distributions of the mean in both the CEYP and non-CEYP groups were negatively skewed. However, the parametric t-test (independent samples t-test, two tailed) was used due to the sample size.

7.2.5 More than one live birth before age 20

Among those who experienced a live birth before age 20 years, 25.2% of CEYP (86/341, 95% CI 20.7 to 30.2%) had more than one live birth before age 20 compared with 12.0% of non-CEYP (53/440, 95% CI 9.2 to 15.5%), with the difference between the groups statistically significant at p<0.001 (Pearson Chi-Square, two-sided test). In this context, having more than one live birth before age 20 refers to two or more pregnancies resulting in a live birth (as defined in Appendix 13), rather than multiple births from the same pregnancy.

7.3 Termination of pregnancy before age 20

7.3.1 Proportion experiencing a termination of pregnancy before age 20

CEYP were more likely to experience a termination of pregnancy before age 16, 18 and 20 than their non-care experienced but similarly deprived peers (Table 7.4). However, the differences were small and not always statistically significant. 11.2% of CEYP experienced a termination of pregnancy before age 20 compared with 8.5% of non-CEYP (p<0.05).

Table 7.4: Proportion experiencing a termination of pregnancy before age 16, 18 and 20 years, for fully matched CEYP (n=889) compared with fully matched non-CEYP (n=2664)

	CEYP (n=889)			non-CEYP (n=2664)			Statistical significance of difference between groups*
	number	%	95% CI	number	%	95% CI	
Termination of pregnancy before age 16	20	2.2%	1.4-3.5%	34	1.3%	0.9-1.8%	p<0.05
Termination of pregnancy before age 18	56	6.3%	4.8-8.1%	129	4.8%	4.1-5.7%	p=0.090
Termination of pregnancy before age 20	100	11.2%	9.2-13.5%	226	8.5%	7.5-9.6%	p<0.05

CEYP (care experienced young people); CI (confidence interval); non-CEYP (non-care experienced young people). *Pearson Chi-Square, two-sided test.

The proportion of CEYP experiencing a termination of pregnancy before age 20 was slightly higher than that observed in the general population. Among women in the general population who were born in Fife from 1976 to 1999, the proportion who experienced a termination of pregnancy before age 20 years ranged from 3.1% (95% CI 2.3 to 3.9%) to 9.8% (95% CI 8.6 to 11.0%), depending on the birth year considered (Appendix 18). When the general population estimates for those born in each year from 1976 to 1999 were weighted to match the birth year profile of the 889 fully matched CEYP in the fully matched analysis, the expected proportion of women having a termination of pregnancy before age 20 that would have been observed in the general population was estimated to be 7.6%.

7.3.2 Relative risk of experiencing a termination of pregnancy before age 20

The relative risk of experiencing a termination of pregnancy before age 16, 18 and 20 years for CEYP compared with non-CEYP is shown in Table 7.5.

CEYP were 33% more likely than non-CEYP to experience a termination of pregnancy before age 20 (RR 1.33, 95% CI 1.06 to 1.66), 30% more likely than non-CEYP to experience a termination of pregnancy before age 18 (RR 1.30, 95% CI 0.96 to 1.76) and 76% more likely than non-CEYP to experience a termination of pregnancy before age 16 (RR 1.76, 95% CI 1.02 to 3.05). However, the confidence intervals for these estimates were either statistically non-significant (for terminations before age 18) or close to one (for terminations before age 16 and before age 20).

Table 7.5: Relative risk and odds of experiencing a termination of pregnancy before age 16, 18 and 20 years for fully matched CEYP (n=889) compared with fully matched non-CEYP (n=2664)

Outcome	Proportion with outcome		RR (with 95% CI)	Unadjusted OR (with 95% CI)	Adjusted OR (with 95% CI)*
	CEYP	non-CEYP			
Termination of pregnancy before age 16	20/889	34/2664	1.76 (1.02-3.05)	1.78 (1.02-3.11)	1.78 (1.02-3.12)
Termination of pregnancy before age 18	56/889	129/2664	1.30 (0.96-1.76)	1.32 (0.96-1.83)	1.32 (0.96-1.83)
Termination of pregnancy before age 20	100/889	226/2664	1.33 (1.06-1.66)	1.37 (1.07-1.75)	1.37 (1.07-1.76)

CEYP (care experienced young people); CI (confidence interval); OR (odds ratio); non-CEYP (non-care experienced young people); RR (relative risk). *Adjusted for all matching variables (i.e. parental socioeconomic group at time of participants' birth; Carstairs deprivation index quintile of maternal postcode at time of participants' birth; and year of birth).

7.3.3 Odds of experiencing a termination of pregnancy before age 20

The odds of experiencing a termination of pregnancy before age 16, 18 and 20 years for CEYP compared with non-CEYP are shown in Table 7.5.

The unadjusted odds of having a termination of pregnancy as a teenager ranged from between 1.32 and 1.78 times higher among CEYP than non-CEYP, depending on the age of termination being considered (Table 7.5). The increased unadjusted odds of termination of pregnancy among CEYP were statistically significantly higher for termination of pregnancy before age 16 and age 20, but not age 18. However, even for the statistically significantly increased unadjusted odds observed among CEYP for termination of pregnancy before age 16 and age 20, the lower limits of the confidence intervals for the odds ratios were close to one.

Adjusted odds were again calculated but, as discussed in Section 7.2.2, made little difference to the odds observed and so the unadjusted odds are used hereafter for simplicity.

7.3.4 Mean age at first termination of pregnancy

Among those who had a termination of pregnancy before age 20, the mean age at first termination of pregnancy was similar among CEYP and non-CEYP (17.56 years versus 17.55 years, with no statistically significant difference, Table 7.6).

Table 7.6: If had a termination of pregnancy before age 20 years mean age at first termination of pregnancy, among fully matched CEYP (n=889) and fully matched non-CEYP (n=2664)

CEYP			non-CEYP			Mean difference (95% CI)	Statistical significance of difference between groups*
Number	Mean age	Standard deviation	Number	Mean age	Standard deviation		
100	17.56 years	1.63	226	17.55 years	1.37	0.01 years (-0.36 to +0.38)	p=0.966

CEYP (care experienced young people); CI (confidence interval); non-CEYP (non-care experienced young people). *Distributions of the mean in both the CEYP and non-CEYP groups were negatively skewed. However, the parametric t-test (independent samples t-test, two tailed, Levene's test for equality of variances - equal variances not assumed) was used due to the sample size.

7.3.5 Repeat termination of pregnancy before age 20

Among those who experienced a termination of pregnancy before age 20 years, 14.0% of CEYP (14/100, 95% CI 7.9 to 22.4%) had more than one termination of pregnancy before age 20 compared with 11.9% of non-CEYP (27/226, 95% CI 8.0 to 16.9%), but the difference was not statistically significant (Pearson Chi-Square, two-sided test, p=0.606).

Chapter 8: Results Part 3 - Feasibility of data linkage approach

8.1 Overview

A further objective of the study was to determine whether the data linkage approach used is a useful approach that could be extended to examine other health outcomes of interest for CEYP in Fife (Section 5.3). As discussed in Chapter 4, teenage pregnancy is just one of several adulthood health outcomes that Fife Corporate Parent Board wish to identify for CEYP in Fife. Given the potential advantages of a data linkage approach for determining outcomes for CEYP, assessing the feasibility of using such an approach is important.

This thesis shows that the cross-sectoral data linkage approach used is technically possible and as such could be extended to other outcomes of interest. However, the data linkage process was challenging and very time consuming and, in its current form, is unlikely to be a practical way forward for NHS Fife and the Fife Corporate Parent Board for considering health outcomes for CEYP in Fife.

8.2 Challenges encountered with the data linkage process

8.2.1 Time taken to undertake study

The main problem encountered in the study was the time required to undertake it. In total, the data linkage study was undertaken during a nine-year period, from the early planning stage in 2013 through to completion in April 2022, considerably longer than the previously anticipated four years.

During the study planning, it was anticipated that the data linkage would take time due to the approvals required and the various steps involved in the data linkage process. For example, given the sensitivity of the topic, understanding and addressing the information governance issues in the ethics and PBPP applications was a key part of the process. These both required careful consideration and it was known that the ethics and PBPP approvals would have to be applied for serially, rather than in parallel. Similarly, it was anticipated that the various steps of the data linkage process, such as the CHI indexing and data extraction, would take time. It was also anticipated that there would be additional delays along the way (for example, delays were encountered when errors in the selection of the non-care experienced cohort were identified, requiring re-selection of the cohort). The time-consuming nature of these issues was therefore not unexpected. However, the following aspects of the data linkage process all took much longer than anticipated: securing the legal data agreements with Fife Council; preparing the social care administrative data; and accessing the physical Safe Haven to allow analysis of the data. The cumulative effect of all these processes and delays led to the significant time required to undertake the study.

8.2.2 Legal data agreements

The use of the social care data in the study required the permission of Fife Council and the study was undertaken with the support of Fife Council. For example, the study secured senior support from the Council early in the study process and the Council provided the author with considerable practical support with the logistics of accessing and understanding the social care data. However, arranging the various legal data sharing and processing agreements between the Council, NHS National Services Scotland, NRS and the University of St Andrews (Section 5.4) was a time-consuming process and was one of the most challenging aspects of the study.

Discussions with the Data Protection Team at Fife Council about the legal agreements required to allow the use of the social care data for the study began in February 2016, with all the legal data sharing and processing agreements in place by September 2018. It was anticipated that it might take several months to agree the legal data agreements as it was the first time that this type of research had been undertaken by the author and by NHS Fife and Fife Council. For example, although the study was developed at a time of increasing partnership working and health and social care integration, there were no existing data sharing arrangements in place between Fife Council and NHS Fife to allow such a linkage. Undertaking the research as part of a university-based research project also added an additional dimension to the agreements required. However, the time required to secure the data agreements took much longer than anticipated. The additional time taken was partly due to changes in Council staff, the inexperience of the author in navigating the Council processes and changes in UK data protection legislation with the introduction of the General Data Protection Regulation in May 2018. The time taken may also partly reflect the different research cultures within health and social care organisations, with less research infrastructure available within social care than the NHS, for example (Mezey, et al., 2015).

8.2.3 Social care administrative data

As described in Section 5.6.8, extracting, cleaning and summarising the social care data for the study took approximately 24 weeks. This was spread over the course of the study and, given the other delays experienced in the study, did not delay the overall completion of the study. However, preparing the social care data did take longer than anticipated and is an important issue to consider for future research. It highlights that, while data linkage may use existing sources of data, the data required is not necessarily readily accessible or in the required format. Preparing administrative data for data linkage purposes can be a time-consuming process, despite not requiring the collection of new data, as illustrated by the time required to extract the SWIS data in this study for example. This reflects the potential 'messiness' of data which has been collected for administrative rather than research purposes, with administrative social care data potentially requiring considerable cleaning and organisation before it can be used for data linkage research purposes (Connelly, et al., 2016).

8.2.4 COVID-19 pandemic

The study was also significantly impacted by the COVID-19 pandemic restrictions. It had been agreed with Fife Council that analysis of the social care placement data would be via the physical National Safe Haven at Edinburgh BioQuarter, due to the sensitivity of the data being analysed[19]. The social care placement datafile from Fife Council was transferred to eDRIS in April 2020, with analysis of the final linked dataset via the physical Safe Haven due to commence in April 2020. However, due to national COVID-19 restrictions, the physical Safe Haven was closed from March 2020 and remained closed for over two years. This significantly delayed the data analysis for the study. Remote access to outcome data for the non-care experienced cohort was obtained

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[19] The physical Safe Haven provides a secure access point in a physically secure area where external devices cannot be used (Public Health Scotland, 2020d).

in June 2021, which allowed analysis of part of the data. Remote access to part of the social care data was then agreed with Fife Council in January 2022. However, access to the full study data via the physical Safe Haven was not obtained until the end of March 2022, five weeks before the completion date for the study. As a result, the time available for analysis of the fully linked dataset was limited so data analysis of the key outcomes was prioritised.

8.3 Implications of time required for study

The resources and time required to undertake the data linkage study raise considerable doubts over whether it is a feasible approach for a Corporate Parent Board or health board to use to assess health outcomes for CEYP. It could be argued that the delays caused by the COVID-19 pandemic were unprecedented and are unlikely to be repeated in future work. However, even without the delays caused by the pandemic, the study took much longer than anticipated. Undertaking the study over such a long time period was only possible because the author was able to undertake the study as part of a part time research degree and had the flexibility to be able to pause the degree process while awaiting the legal data agreements and the re-opening of the physical Safe Haven. From a Corporate Parent Board and health board perspective, given the absence of alternative research on teenage pregnancy rates among CEYP in Scotland, the study's findings remain relevant despite the delays but the process was far from expeditious. In its current form the data linkage study is likely to be too time consuming and resource intensive to be a realistic way forward for local Corporate Parent Boards and health boards to assess CEYP health outcomes. Such research may instead need to remain within an academic setting or be adapted to suit the more pressing timescales and limited resources available in a Corporate Parent Board or health board setting. Potential ways to modify the data linkage process to make it more feasible are discussed in Section 9.4.

Chapter 9: Discussion

9.1 Overview

This chapter discusses the strengths and weaknesses of the data linkage study. It considers issues raised about undertaking this type of cross-sectoral data linkage and how the study could be improved, including how it could be adapted to make it more feasible to undertake in a Corporate Parent Board or health board setting. It then discusses the teenage pregnancy findings.

9.2 Strengths of the data linkage study

9.2.1 Identification of CEYP

The study has several strengths. Firstly, it was able to access social care administrative data from Fife Council to identify the full cohort of female CEYP looked after by Fife Council between October 1991 and March 2015. As such the care experienced cohort identified from SWIS and SWIFT was representative of the full range of CEYP in Fife, not just those who would otherwise have actively engaged in research.

The study was also able to access social care administrative data on care placements which, given the potential complexity of care placement histories, is likely to be more reliable than self-reported care placement histories, particularly for those with multiple placements.

9.2.2 CHI linkage for care experienced group

The probability matching process was able to identify an acceptable CHI number for over 90% (90.5%) of the care-experienced group (Section 6.2), despite the challenges of aliases, adoption name changes and the historic nature of the postcodes available (Section 5.6.9). This was higher than the linkage rate of 85% that was used in the power calculations for the study (Section 5.9). The linkage rate was not quite as high as that seen in other Scottish CEYP data linkage studies, however. For example, a national demonstration project in Scotland in 2011-12 achieved a safe linkage to CHI for 94-95% of LAC using probabilistic linkage and date of birth, gender and home postcode variables from the national Pupil Census annual return (Clark, et al., 2017).

Probabilistic linkage to the CHI in the current study used names, date of birth, gender and postcodes (Section 5.6.9) but, despite the inclusion of names, achieved a lower linkage rate than Clark et al. (2017). The lower linkage rate may reflect the historic nature of the cohort and the complexity of the postcode history for some in the cohort. Nonetheless, the linkage rate achieved in the study resulted in the inclusion of a much higher proportion of CEYP than would likely have been achieved with a study design requiring the active recruitment and individual consent of CEYP.

The study also had the advantage that it was able to directly link social care administrative data to the CHI database, without requiring linkage via other datasets. This differs from the national demonstration project by Clark et al. (2017) and the recent *Children's Health in Care in Scotland* longitudinal study by Allik et al. (2021) which involved first linking CLAS data to the national Pupil Census using the Scottish Candidate Number[20] within CLAS and then using personal identifiers within the Pupil Census to link to the CHI database. Linkage via the Pupil Census was necessary in both Clark et al. and Allik et al. as CLAS returns do not include sufficient personal identifiers to reliably allow linkage to CHI (Clark, et al., 2017). However, the Pupil Census only covers children in publicly funded schools (Clark, et al., 2017) which in turn limits the studies to only those in publicly funded schools. In contrast, the current study was able to link to the CHI for CEYP regardless of their schooling.

9.2.3 Comparison of fully matched CEYP with those not fully matched

Another strength of the study was that it was able to compare several care characteristics of CEYP who were able to be linked to an acceptable CHI number and then fully matched to non-CEYP in the comparator group, with CEYP who could not be fully matched (Section 6.4). Such comparisons are important as the CHI linkage process has the potential to have introduced bias if those who were linked differed in some important aspect from those who were not able to be linked (Harron, et al., 2017). The process of matching CEYP to non-CEYP also has the potential to have introduced bias

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[20] The Scottish Candidate Number is a unique number assigned to children when they start a publicly funded school in Scotland or when they undertake assessments by the Scottish Qualifications Authority (Clark, et al., 2017). Preschool children will therefore not have a Scottish Candidate Number. Those educated at home, those in independent schools and those who have already left school also might not have a Scottish Candidate Number (Scottish Government, 2021c).

if those who were able to be fully matched differed in some important aspect from those who could not be fully matched. While it does not prove that the CEYP included in the fully matched analysis presented in Chapter 7 were representative of the care experienced cohort as a whole, the comparison in Table 6.1 suggests that CEYP who were fully matched were at least generally representative of the wider care experienced cohort for the care characteristics considered.

9.2.4 Identification of outcome data

An important strength of the study was that it was able to link to high quality outcome data on births and terminations from routinely collected national statistics. It was thereby able to avoid the use of self-reported data which may be subject to recall bias, particularly for sensitive outcomes such as terminations (Kelly, et al., 1997). Importantly, the study was able to identify outcome data for all participants, provided a CHI number was available, without the need to contact participants, thereby avoiding losses to follow up that other study designs may encounter. For CEYP in particular, who may be difficult to follow up on leaving care for example (Section 4.3.2), this is an important strength of the data linkage approach used.

9.2.5 Consideration of socioeconomic deprivation

Another important strength of the study was that it was able to compare the proportion of CEYP with a termination or live birth as a teenager with non-care experienced young people from a similarly deprived background. This is an important advance over existing UK research, such as the Welsh audit by Craine et al. (2014) which showed that current LAC were more likely to experience a teenage pregnancy than non-LAC but did not account for the effect of socioeconomic deprivation (Section 2.12.3).

Importantly, the current study used both an individual and area-based measure of socioeconomic position (Section 5.7.3). Both are useful. For example, although individual measures of socioeconomic position have their limitations (Galobardes, et al., 2006a; 2006b), including an individual measure is important as area-based measures do not necessarily indicate individual socioeconomic deprivation. Similarly, while individual socioeconomic position may have a greater influence on health, area-based measures acknowledge that “the socioeconomic conditions of an area” (such as the neighbourhood where a person lives) can also influence health, over and above individual characteristics (Galobardes, et al., 2006b, p.99). The SIMD (an area-based measure), the Carstairs index (an area-based measure) and Social Class based on Occupation (an individual-based measure) have all been shown to be highly associated with teenage pregnancy in Scotland (McCall, et al., 2015).

9.2.6 Matching of groups by birth year

The study matched the non-care experienced cohort to the year of birth of the care-experienced cohort. Teenage pregnancy rates have changed over time (Public Health Scotland, 2020a) so matching for year of birth in the selection of the non-care experienced cohort was important to ensure that the groups were comparable in the time period they considered. Of note, the study spans a wide time period, with participants ranging from those currently in their early 20s through to those in their 40s. The estimates of teenage pregnancy identified in the study will therefore not necessarily reflect current rates of teenage pregnancy. However, the care-experienced and non-care experienced groups will be comparable in the time period they consider.

9.3 Limitations of the data linkage study

9.3.1 Use of administrative social care data

Many of the strengths of the study lie in the sources of data linked. However, these data sources also contribute to the study’s limitations. For example:

- Fife Council’s SWIS and SWIFT social care administrative databases are thought to include all children looked after by Fife Council. They are the most complete data available (and are the data upon which CLAS returns are made). However, the study cannot verify their completeness.
- The manual extraction of data from SWIS was undertaken by the author. The data were checked for errors such as missing data items but the data were not double-entered, due to limited resources, and so transcription errors may have occurred. Similarly, the SWIS and SWIFT data were cleaned and summarised by the author only and errors may have occurred during this process.

- The data held within SWIS and SWIFT provide details of care placements whilst looked after by Fife Council but do not include data on time spent under the care of other local authorities (since local authorities hold their data separately, with no national collation of such data). The study will therefore have underestimated the total time spent in care for some of those in the care experienced cohort if they also spent time in the care of another local authority.
- While SWIS and SWIFT provide details on placements under the care of Fife Council they do not indicate the quality of placements, although they do indicate if a young person has experienced multiple placements.
- Young people may have complex care histories with, for example, more than one care episode, multiple care placements and moves between different care settings. While SWIS and SWIFT provided details of each care episode and placement, summarising the care histories was difficult. For example, the comparison in Section 6.4 attempted to summarise care histories by considering factors such as age at first entry to care, total number of care placements and whether care was provided at home only, in kinship or foster care but not residential care or whether it included residential care. However, this may miss other important aspects of care history. For example, number of placements and placement stability are known to be associated with a range of outcomes for LAYP (Jones, et al., 2011). However, it is possible that the number of placements may not be as important as the number of different carers. For example, if a young person re-enters care, being placed with a known foster carer may be less destabilising than being placed with an unknown foster carer. The study extracted data from SWIS and SWIFT on whether each care placement was with a known or new carer. However, it was not possible to analyse this data due to time constraints.
- The study extracted data on the reason for care, based on the legal statutes recorded in SWIS and SWIFT which provide broad categories for the reason for being looked after. However, the reason for care data recorded in SWIS and SWIFT involved multiple categories which have changed over time and adequately summarising the reason for being looked after was therefore difficult. It was again not possible to analyse this data due to time constraints. However,

as noted in the health needs assessment of LAC in Scotland by Scott, Hattie and Tannahill (2013), legal reasons for care are not always clearly defined or consistently used, limiting their use.

9.3.2 Linkage to CHI

Errors in the linkage of the care-experienced group to the corresponding CHI number may have introduced bias. There are two potential sources of linkage error: false matches and missed matches (Harron, et al., 2017).

False matches may have occurred if the demographic details of CEYP were matched to the wrong CHI number during the probabilistic matching process. It is difficult to know the impact of such errors but false matches are thought to “typically (but not always) add noise to estimates, diluting the association between variables captured in different datasets and biasing effect estimates towards zero” (Harron, et al., 2017, p.1700). If so, this may have led to an underestimation of the difference in teenage pregnancy outcomes between the care experienced and non-care experienced groups.

Missed matches occur “when records belonging to the same individual are not linked” (Harron, et al., 2017, p.1700). Missed matches are known to have occurred in the study as it was only possible to match 90.5% of the care-experienced group to a CHI number, despite the expectation that all CEYP will have had a CHI number (as all CEYP are expected to have been registered with a General Practitioner at some point). If these missed matches did not occur randomly, then subgroups of CEYP may be over or underrepresented in the linked cohort (Harron, et al., 2017). While the comparison of care characteristics described above in Section 9.2.3 goes some way to address this issue, bias is still possible as those who were CHI linked and then fully matched to the non-care experienced comparator group may have differed from those who were not fully matched on other important characteristics which were not assessed.

Approaches to identifying sources of bias in data linkage studies include: using a gold standard dataset to assess the accuracy of matches and quantify linkage error rates (which was not possible in this study); comparing the characteristics of linked and unlinked data (discussed above); and using sensitivity analyses to assess the impact of changes to the linkage process, such as changes to linkage thresholds (Hanlon, et al., 2017). The study was not able to undertake sensitivity analyses of different probabilistic matching thresholds, but this would have been a useful additional approach to assessing the potential for bias in the linkage.

9.3.3 Outcome data

While the outcome data used has many strengths, it also has limitations. For example, SMR includes only Scottish data. The study will therefore only have identified births and terminations occurring within Scotland and will have underestimated the proportion of young people with a teenage live birth or termination, if some young people had a live birth or termination outwith Scotland. However, this will not have biased the results unless the proportion experiencing a live birth or termination outwith Scotland varied between groups.

As discussed in Section 5.8.3.2, the study used SMR data to identify terminations, rather than the more complete, gold standard CMO abortion data. The study will therefore have underestimated the true proportion of young people, in both groups, experiencing a teenage termination. However, this will not have biased the results unless the proportion having a termination not recorded in SMR varied between groups.

The study used SMR01 and SMR02 data, but not SMR00 data, to identify terminations (Section 5.8.3.2). Local data checks in August 2019 showed that SMR00 was not yet used in Fife to code terminations of pregnancy. A check against national data in late 2016 also showed that SMR00 was only rarely used to code terminations of pregnancy. However, coding practice varies by health board and it is possible that a small proportion of terminations occurring outwith Fife will have been missed by not including SMR00. This proportion is likely to be very small for the study period considered but future studies may wish to include SMR00, as termination practice evolves over time.

9.3.4 Non-care experienced comparison group

9.3.4.1 Matching limitations

The inclusion of the non-care experienced but similarly deprived comparison group was an important part of the study. However, it had limitations. For example, it was not possible to fully match every CEYP to three non-care experienced individuals (Section 6.3).

9.3.4.2 Identifying care experience

It was also not possible to guarantee that no-one in the non-care experienced cohort had been looked after, only that no-one in the non-care experienced group had been looked after by Fife Council (Section 5.7.4). It had originally been intended that the non-care experienced cohort would be restricted to those who were known to have lived in Fife from birth until age 16, so that the cross-checking of the non-care experienced cohort against the care-experienced cohort would ensure that no-one in the non-care experienced cohort had been looked after (as they would only have ever lived in Fife and would be known to never have been in the care of Fife Council). It was originally anticipated that this would be achieved by only selecting the non-care experienced cohort from those who had a Fife postcode registered in the CHI database throughout their childhood (using the CHI residential dataset). However, in practice this was not possible and the non-care experienced cohort was instead limited to those resident in Fife at birth and resident in Fife at the time the non-care experienced cohort was selected in 2019. It is therefore possible that some of the non-care experienced group may have spent some of their childhood outwith Fife and potentially been in the care of other Council areas, and as such may have been incorrectly classified in the study as non-care experienced. However, given the higher levels of teenage pregnancy observed among the care experienced cohort in the study, such misclassification of care experience would have underestimated the true increased risk among CEYP.

9.3.4.3 Identifying socioeconomic position

The non-care experienced group was matched to the care-experienced group using both an individual and area-based measure of socioeconomic position at birth (Section 5.7.3). Matching for socioeconomic position at birth is useful given the influence of prenatal and early life influences on health, but socioeconomic position at birth may not represent socioeconomic position during the teenage years. When assessing local need, service planning in Scotland often takes account of factors such as the SIMD profile of the local population. Planning teenage pregnancy related services may therefore include consideration of the SIMD profile of the local teenage population. As such, it might have been useful if the study had also been able to match on a measure of teenage socioeconomic position. However, it was not possible to reliably determine a teenage measure of socioeconomic position for the young people in the study. For example, for the care experienced group it was not possible to accurately identify the pre-care deprivation postcode from SWIS (Section 5.6.7) and placement postcodes may be representative of the carer rather than the young person, particularly for short placements.

Interestingly the distribution of the maternal Carstairs deprivation index quintile at the time of the participants' birth that was observed among the care experienced cohort in the study (Section 6.5.3) showed a different, 'less deprived' pattern than that observed in the national health needs assessment by Scott, Hattie and Tannahill (2013). Scott, Hattie and Tannahill assessed the SIMD profile for LAC in Scotland who had a Supervision Requirement on 30th June 2012, based on the parental current home address, and found that the proportion of LAC in each SIMD quintile continually increased as the quintiles progressed from the most to least affluent (Scott, Hattie and Tannahill, 2013, pp.74-75). They found that the parental address of only 9% of LAC were in the two most affluent SIMD quintiles while 56% were in the most derived quintile. The difference between the SIMD deprivation profile of LAC in Scott, Hattie and Tannahill (2013) and the Carstairs deprivation index profile of CEYP in the study may reflect the different time periods considered, differences between the SIMD and Carstairs deprivation measures or that Scott, Hattie and Tannahill considered only LAC with a Supervision Requirement. Or it may reflect that socioeconomic position for LAC changes during childhood.

9.3.5 Lack of confounding variable data

As shown in Chapter 3, adjusting for various confounding factors can help illustrate the degree to which the increased risk of teenage pregnancy observed among CEYP is due to confounding factors. The study was not able to collate data on potential confounding variables (other than matching for gender, year of birth and socioeconomic position at birth). It therefore cannot contribute to the wider debate around the degree to which the excess risk of teenage pregnancy observed among CEYP can be accounted for by other factors and whether care may even protect against teenage pregnancy for some CEYP (Section 3.6.4). Expanding the linkage to identify potential confounding factors or comparing teenage pregnancy outcomes among CEYP with young people investigated by Social Services but not placed in care would however be an interesting area for future research.

9.3.6 Data analysis

As discussed in Section 8.2.4, the data analysis focused on the study's primary objectives (Section 5.3). As a result, the analysis did not consider secondary objectives such as antenatal risk factors or postnatal outcomes among pregnant CEYP compared with their pregnant non-care experienced peers (Section 5.8.1). It was also not possible to undertake sensitivity analyses, such as broadening the analysis to include all CEYP who were partially matched (Section 6.3).

9.3.7 Generalisbility of findings

9.3.7.1 Fife Council versus NHS Fife LAC populations

Fife Council and NHS Fife are coterminous but are responsible for slightly different populations of LAC. NHS Fife is responsible for all LAC residing in Fife. This includes children looked after by Fife Council who are placed within Fife, as well as children looked after by other local authority areas who are placed within Fife, but not children looked after by Fife Council who are placed outwith Fife. Fife Council is responsible for all children it places within Fife as well as those it places outwith Fife (for example, in specialist placements outwith Fife). As the study uses Fife Council data it relates to children looked after by Fife Council only. As such it is broadly but not fully comparable to all LAC for whom NHS Fife is responsible.

9.3.7.2 Generalising findings from Fife to elsewhere in Scotland

Given the lack of data on teenage pregnancy rates among CEYP in Scotland, the study's findings are likely to be of interest to other health board and local authority areas in Scotland. This raises the issue of how similar the teenage pregnancy outcomes observed for CEYP in Fife in this study are likely to be to those of CEYP elsewhere in Scotland.

Fife is the third largest local authority area in Scotland with a population of approximately 374,000 (National Records Scotland, 2021a), representing 7% of the total population of Scotland (National Records Scotland, 2021b). It is a large rural area with several centres of population (NHS Fife, 2022). The degree to which the findings from the study are generalisable to other areas is ultimately a judgement to be made by those wishing to generalise the data to their area. However, comparing the characteristics of different areas can help inform this judgement. The Scottish Public Health Observatory produces health and wellbeing profiles which allow comparison of a Scottish health board or council area with the national average, as well as allowing comparisons between different health boards or council areas. The health and wellbeing profile in Appendix 19 summarises a range of health indicators for Fife, compared with the national average[21] (Millard, et al., 2016). The profile shows that, for example:

- Life expectancy is similar;
- All-cause mortality among young adults (aged 15-44 years) is similar;
- Smoking prevalence among adults is similar;
- The rate of alcohol-related deaths is similar;
- The rate for drug-related hospital stays is higher in Fife than the national average;
- Primary school attendance is similar to the national average but secondary school attendance is lower than the national average;
- The percentage of young people not in employment, education or training is higher than the national average;

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[21] The time point of the health and wellbeing profile indicators in Appendix 19 ranges from 2010 to 2014, depending on the indicator considered. Indicators for other time periods are available from the Scottish Public Health Observatory via its Online Profiles Tool (https://scotland.shinyapps.io/ScotPHO_profiles_tool/).

- The percentage of the working age population who are employment deprived is higher than the national average;
- The percentage of children living in poverty is higher than the national average;
- The proportion of mothers smoking during pregnancy is higher than the national average;
- Exclusive breastfeeding rates are lower than the national average;
- Child dental health is better than the national average;
- Immunisation uptake at age 24 months is similar; and
- The teenage pregnancy rate is higher than the national average.

The latter indicator is perhaps the most important factor which may limit generalisation of the study's findings to other areas of Scotland. As teenage pregnancy rates among young people generally in Fife are higher than the national average, the teenage pregnancy rates among CEYP in Fife that were observed in this study may also be higher than those of CEYP nationally. Caution is therefore required in generalising the teenage pregnancy rates observed in this study to other areas of Scotland. Having said this, the relative risks observed in the study may still be generalisable to other areas. However, this is a judgement to be made by those wishing to generalise the data to their particular area.

9.3.7.3 Generalising findings from Fife to outwith Scotland

Generalising the study's finding to further afield, outwith Scotland, is likely to be more difficult due to differences in child welfare systems between countries. For example, the legal definition of LAC varies between UK countries (Section 2.2). Nonetheless, the overall pattern of risk observed in the study may still be useful, especially when taken alongside the pattern of risk observed in the international literature reviewed in Chapter 3.

9.3.7.4 Generalising from the study time period to the present

Finally, but importantly, the study considered a broad time frame, with outcomes occurring from the early 1990s to 2019. The experience of those early in the study period may not reflect the current experience of CEYP, as described in Section 9.2.6.

9.4 How could the study be improved?

9.4.1 Overview

As discussed in Chapter 8, the data linkage study in its current format is unlikely to be a practical way forward for NHS Fife and the Fife Corporate Parent Board to assess health outcomes for CEYP. There are, however, several ways in which the data linkage process could be improved or made simpler.

9.4.2 National identifier

The use of different unique identifiers in different sectors makes cross-sectoral data linkage more complex (Scottish Government, 2012). The introduction of a national unique identifier that could be used for the whole population across sectors, similar to that used in Sweden for example (Ludvigsson, et al., 2009), would simplify and facilitate cross-sectoral data linkage. However, the introduction of a national ID or similar scheme may be unacceptable to the public due to privacy concerns and may be politically difficult to implement (Schafer, 2015).

9.4.3 Social care identifiers

There is currently no national social care identifier, with different local authorities using different unique identifiers, as well as different unique identifiers being used within the same local authority. In the absence of a national ID, the use of a national social care identifier would make it easier to identify social care data for the same individual across different local authorities. For example, there is currently no national system for identifying care history for CEYP (although the accumulation of CLAS return data over time may in effect act as a national record). The use of a national social care identifier, however, would make it easier to identify a young person’s care history across different local authorities.

9.4.4 Greater availability of CHI

Wider availability of the CHI number within Fife Council’s social care administrative databases would make future data linkage easier as linkage to health outcome data could occur without first needing to probability match demographic details to the corresponding CHI number. As well as being quicker, this would reduce the potential risk of linkage error bias due to false and missed CHI matches. At the start of the current study the CHI number was available for only a very small proportion of the care-experienced group[22]. However, recording of the CHI number within the SWIFT database has improved greatly in recent years and may now be sufficiently high to allow future research using SWIFT to be undertaken without needing to first use probabilistic matching to the CHI number. Using SWIFT records alone would limit such research to more recent CEYP only (as the CHI number is not available in the older SWIS records). However, depending on the age of outcomes being assessed, this may be sufficient.

9.4.5 Extraction of key care placement variables only

The time required to extract social care placement variables could be reduced by: using SWIFT records (which are easier to extract) rather than SWIS; applying for permission to retain the SWIS data that have been extracted for this study to use for future research purposes; and focusing only on key social care variables which are easier to extract and summarise (for example, extracting variables such as age at first entry to care, first placement type, number of placements and duration in care rather than extracting and trying to summarise the full care placement history for each CEYP).

9.4.6 Consideration of multiple health outcomes

Future research could consider a range of health outcomes simultaneously. Whilst this would be more complex than considering just one outcome, it would potentially be a more efficient use of resources and be cheaper to research per outcome.

9.4.7 Using other approaches

Finally, the health and social care policy landscape in Scotland, as well as the data linkage landscape in Scotland, are constantly changing and this evolution may provide better approaches for identifying health outcomes for CEYP. For example, increasing integration of health and social care may remove some of the barriers to data sharing encountered in the study. In time, it should also be possible to use data collected by NHS Fife during the LAC health assessment process locally to explore health outcomes

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[22] In September 2013, a CHI number was available for less than 1% of LAYP in SWIFT. The CHI number was not recorded in SWIS.

for CEYP in later life. Nationally, CLAS return data will also become increasingly useful for identifying health outcomes for CEYP (Scottish Government, 2015b), as the recent national longitudinal *Children's Health in Care in Scotland* study demonstrates (Allik, et al., 2021).

9.5 Discussion of teenage pregnancy findings

9.5.1 Teenage motherhood among CEYP in Fife

The proportion of CEYP in the study who had a live birth before age 20 was high at 38%. As discussed in Chapter 2, early parenthood can be a very positive experience for many CEYP. However, for some, teenage parenthood can be a challenging time due to issues such as social isolation, financial difficulties, unsuitable accommodation, or a lack of family support (Section 2.11.5). The high level of teenage motherhood observed among CEYP in the study, combined with the additional challenges CEYP may face as young parents, mean that the needs of care experienced young parents in Fife may be considerable. As such it is important that NHS Fife and its corporate parenting partners ensure that care experienced young parents in Fife receive the support they require. However, the current literature suggests that, while care experienced young parents may need extra support, they may be reluctant to ask professionals for help (Section 2.11.5) and may find it difficult to trust social care professionals, due to previous experiences, ambiguity over the role of social workers in supporting the young person and the perceived (and potentially real) risk of the intergenerational transmission of care (Section 2.11.6). Meeting the needs of care experienced young parents may potentially be challenging for services. However, as described in Section 2.11.7, teenage parenthood also offers the opportunity for services to develop new, positive relationships with care experienced young parents.

Comparing the proportion of CEYP in the study who had a live birth by the different ages of 16, 18 and 20 years provides a useful insight into when support may be required. For example, 3% of CEYP had a live birth before age 16, rising to 19% of CEYP before age 18. The figure of 19% is important as the needs of 16 and 17 year old care experienced young parents may differ from those of older teenage parents. If, for example, parenthood at age 16 or 17 coincides with when a young person leaves care then their needs may be considerable, as early parenthood may be just one of several challenges they face on leaving care (Section 2.9). By recognising the varied needs of young parents leaving care and offering support to meet the range of needs that they may have (including those not relating directly to parenthood) there are again opportunities for services to engage with care experienced young parents to both support them with early parenthood and to build positive relationships with professionals and services which could help improve a range of outcomes for care leavers in later life.

As discussed in the systematic review in Chapter 3, teenage pregnancy levels among CEYP in the published literature vary considerably (Section 3.6.5). It is therefore important to have local data on teenage pregnancy levels among local CEYP to better assess local need. The study provides such estimates for Fife. However, as well as considering the absolute level of teenage pregnancy, it is also useful to consider the relative level of teenage pregnancy among CEYP compared with their non-care experienced peers. In the study, CEYP were more than twice as likely to experience a live birth before age 20 than their non-care experienced but similarly deprived peers. This relative measure is important as it suggests that care experience is a marker of increased teenage childbirth over and above that associated with socioeconomic deprivation (or at least over and above that associated with socioeconomic position at the time of the young person's birth). This is useful as it can help direct efforts and resources to meet the needs of CEYP. Importantly, however, this does not mean that being in care causes teenage pregnancy (indeed some authors suggest that care may protect against teenage pregnancy as discussed in Section 3.6.4), only that care experience is a marker of increased teenage childbirth risk. This is important to emphasise, to avoid stigmatising care experienced young parents (Section 2.10.3).

Finally, but very importantly, while the study provides a reliable estimate of the high levels of teenage motherhood among CEYP in Fife, it is only one part of the information required to meet the needs of care experienced young parents. Considering the views and lived experience of CEYP is also vital.

9.5.2 Terminations of pregnancy among CEYP in Fife

Interestingly, while termination of pregnancy before age 20 years was also more common among CEYP than their non-care experienced but similarly deprived peers, the differences observed were far less marked than those observed for live birth before age 20. For example, 11% of CEYP experienced a termination of pregnancy before age 20 which was only slightly higher than the 8% figure observed among non-CEYP (RR 1.33, 95% CI 1.06 to 1.66). The risk of a teenage termination of pregnancy was only slightly higher among CEYP compared with non-CEYP, with the relative risk ranging from only 1.3 to 1.76 times higher among CEYP than non-CEYP across the different age bands considered. The apparent difference in the risk pattern for teenage live births and teenage terminations of pregnancy among CEYP in the study is consistent with the observation that teenage childbirth and teenage abortion should be considered as separate outcomes (Section 3.6.9.2).

Having said this, the less marked difference in termination of pregnancy risk between CEYP and their non-care experienced peers does not mean that termination of pregnancy is not an important issue for CEYP. CEYP still had higher rates of termination of pregnancy than both their non-care experienced but similarly deprived peers and the general population. Given that many terminations of pregnancy will represent unplanned and unwanted pregnancies, corporate parents have an important role to play in ensuring that CEYP are able to access the information, services and support they need to prevent unintended pregnancy.

9.5.3 Comparison of study’s findings with the existing literature

Direct comparison of the study’s findings with the existing UK literature on teenage pregnancy rates among CEYP described in Section 2.12.3 is difficult as the age of teenage pregnancy considered varies between studies and many of the existing UK studies consider care leavers, rather than CEYP more generally. However, the study’s figure of 38% of CEYP having a live birth before age 20 is broadly comparable with that observed in the study of care leavers aged 16-21 from six English local authorities by Barn and Mantovani (2007) where 35% of female care leavers were or had been teenage mothers. It is also broadly comparable with the study of young people aged 16-

18 leaving care from seven English local authorities by Wade (2008) where 35% of females were parents or were expecting a child 12-15 months after leaving care.

The odds of teenage childbirth observed in the study are consistent with those observed in the systematic review (Section 3.5.4.3), as is the observation of higher odds of childbirth among younger age groups, although confidence intervals for the odds of live birth before age 16 in the study were wide.

For termination of pregnancy, there is little data with which to compare the study's findings. The proportion of terminations of pregnancy observed in the study is not inconsistent with those recently observed by Allik et al. (2021) where 7.1% of care experienced females aged 11-26 years had experienced an abortion compared with only 3.8% of their general population peers (Section 2.12.3), although direct comparison is difficult due to the different age ranges considered. The odds of termination of pregnancy observed in the study were lower than the unadjusted odds observed in Christoffersen (2003) and Christofferssen and Hussain (2008) but were consistent with the adjusted odds observed in Christoffersen and Hussain (2008) and Leppälahti et al. (2016) (Section 3.5.4.2).

9.5.4 Contribution of study to the wider UK literature

While the study was undertaken to help NHS Fife and Fife Corporate Board better understand teenage pregnancy outcomes among CEYP in Fife, the findings also make an important contribution to the wider UK evidence base on teenage pregnancy among CEYP. By comparing teenage pregnancy rates among CEYP with a non-care experienced but similarly deprived comparison group the study demonstrates that care experience is marker of increased teenage pregnancy risk over and above that associated with socioeconomic deprivation, as discussed above. It also provides valuable information on the occurrence of termination of pregnancy among CEYP. As shown in in the systematic review, there are currently very few studies which compare teenage abortion rates among CEYP with that of their non-care experienced peers (Section 3.6.9.2). This study is able to help fill that gap.

9.5.5 Next steps

9.5.5.1 Issues that could be explored further in the study

The results presented in this thesis focus on the study's two primary objectives of determining: the proportion of CEYP in Fife who experienced a live birth before the age of 20 years compared with that of their non-care experienced but similarly deprived peers; and the proportion of CEYP in Fife who experienced a termination of pregnancy before the age of 20 years compared with that of their non-care experienced but similarly deprived peers. However, there are several other issues that could be explored using the current data:

- It has been suggested that CEYP may not have benefitted from the fall in UK teenage pregnancy rates in recent years (Mezey, et al., 2017). However, there is little evidence to support or refute this. The study covers a wide time period and so the estimates observed may not apply to current CEYP. It would therefore be useful to compare teenage pregnancy rates in the study by birth year, to assess whether the high levels of teenage pregnancy observed in the study applied evenly throughout the study period, or whether more recent CEYP had a lower risk of teenage pregnancy than older CEYP.
- Findings from the systematic review in Chapter 3 suggest that young people who enter care during their teens may have a higher risk of childbirth, potentially due to greater emotional or behavioural problems among those entering care during adolescence (Section 3.6.6). It would be useful to examine whether teenage pregnancy outcomes in the study varied by age at first entry to care.
- It would also be useful to explore whether teenage pregnancy outcomes in the study varied by care placement. It has been suggested, for example, that those in residential care may be at increased risk of engaging in risk taking behaviours, such as becoming sexually active at a younger age, due to low self-esteem, peer pressure and a lack of supervision (Section 2.11.2). It would therefore be useful to explore if those placed in residential care were at higher risk of teenage pregnancy. Similarly, there are concerns that those who are looked after at home may be particularly vulnerable to poorer outcomes generally but may be more likely to have their needs overlooked compared with those looked after

and accommodated away from home (Section 2.8.1). It would therefore be useful to examine whether teenage pregnancy outcomes in the study varied between those looked after at home and those looked after away from home.

- Many existing studies of teenage motherhood focus on care leavers and the needs of care leavers may be more visible than those of CEYP leaving care earlier in childhood. However if, as Combs et al. (2017) suggest, all CEYP are at increased risk of teenage pregnancy regardless of whether they remain in care until they age out or whether they have an earlier care history, then it is important to address the needs of all CEYP, regardless of when they leave care. It would therefore be useful to explore whether the rates of teenage childbirth in the study varied between those who were still in care at age 16 and those who left care at an earlier age.

9.5.5.2 Issues to explore in future research

Future research may wish to consider terminations of pregnancy among CEYP at a national, rather than a health board, level as this would provide greater statistical power for the findings. Future research into terminations of pregnancy may also wish to consider using the CMO abortion data which has a greater coverage than the SMR data used in this study. Using the CMO abortion data would also allow future studies to explore additional factors such as gestation at the time of termination.

Finally, future research may wish to consider pregnancy outcomes for CEYP up to age 26, in line with the Scottish Government's Pregnancy and Parenthood in Young People Strategy (Scottish Government, 2016d). The extension of the care leaving age in Scotland (Section 2.9) potentially provides greater opportunities for corporate parents to support CEYP in preventing unintended early pregnancy and to support care experienced young parents and their children. The implementation and impact of the extension in care leaving age could be explored in future research.

Chapter 10: Conclusions

Corporate parents have a responsibility to work together to meet the needs of CEYP. This includes expecting the same outcomes for CEYP as a good parent would want for their own children. Reducing health inequalities is key national priority in Scotland and there is increasing recognition that health outcomes for looked after children and young people are generally poorer than their non-looked after peers. Less is known about health outcomes for CEYP as they leave care and enter adulthood but there are concerns that health inequalities may persist into adulthood.

The needs and experiences of CEYP vary considerably. Children enter care for a variety of reasons. Some experience only a brief episode in care while others experience a single, long-term placement and others experience multiple episodes of care throughout their childhood. On leaving care, most children return home. However, for those remaining in care until they 'age out' of the care system from age 16 onwards, the transition to adulthood can be particularly challenging. Care leavers face the same challenges as many young people when making the transition to independent, adult life such as gaining qualifications, finding employment, managing finances and establishing a home. However, they often have to make this transition at a younger age and in more difficult circumstances than their non-care experienced peers. Care leavers' experiences vary but, in general, they are likely to have fewer educational qualifications, poorer access to education and training, higher levels of unemployment, higher levels of homelessness, poorer mental health and less family support than their non-care experienced peers. They may also experience social isolation. There is increasing recognition that care leavers in Scotland require greater support, over a longer period of time, to improve outcomes and this is reflected in the recent extension of the care leaving age in Scotland whereby young people who are looked after in foster, kinship or residential care can remain in their care placement until age 21, with aftercare support extended until age 26.

This thesis considers teenage pregnancy outcomes among CEYP in Fife. Teenage pregnancy is an important issue for young people generally, but is a particularly important issue for CEYP as they may find it harder to prevent an unplanned pregnancy and may require extra support as young parents but be less likely to receive it. Corporate parents have an important role to play, just as any good parent would, to empower CEYP to prevent unwanted pregnancy, to support CEYP to make an informed choice if they become pregnant and to support care experienced young parents. However, despite its importance, little is known about teenage pregnancy rates among CEYP in Scotland.

The current UK literature suggests that LAYP experience higher levels of teenage pregnancy than their non-looked after peers and that care leavers experience high levels of teenage parenthood. However, existing UK studies are either now dated or limited by factors such as: small sample sizes; low response rates; reliance on survey data where those participating may not represent the wider care experienced population; and the lack of a non-care experienced comparator or, where a general population comparator is available, lack of accounting for the effect of socioeconomic deprivation on the teenage pregnancy rates observed.

The systematic review that was undertaken as part of this thesis considered the occurrence of teenage pregnancy among CEYP in very high Human Development index countries, including the US and Scandinavia, and showed that teenage pregnancy is more common among CEYP than their non-care experienced peers. The pattern of increased risk observed in other countries suggests that CEYP in the UK are also likely to be at increased risk of teenage pregnancy. However, differences between countries makes generalising between settings difficult. Furthermore, much of the existing research focuses on teenage motherhood, with few international studies comparing the risk of teenage induced abortion among CEYP with that of their non-care experienced peers.

The data linkage study undertaken for this thesis linked social care data for females looked after by Fife Council between October 1991 and March 2015 to NHS teenage pregnancy data to examine if CEYP in Fife were more likely to experience teenage motherhood and teenage induced abortion than their non-care experienced peers.

Importantly it compared teenage pregnancy outcomes among CEYP with those of their non-care experienced but similarly deprived peers. This is important as being looked after and teenage pregnancy are both associated with socioeconomic deprivation. One would therefore expect to see higher teenage pregnancy rates among CEYP compared with the general population, regardless of whether care experience is associated with an increased risk of teenage pregnancy.

The study found high levels of teenage childbirth among CEYP in Fife, with 38% of CEYP having a live birth before age 20, compared with 17% of their non-care experienced but similarly deprived peers and 10% of the general population. The high level of teenage childbirth observed among CEYP, combined with the extra needs that care experienced young parents may have, suggests that there may be a considerable need to support CEYP who are young parents. Indeed, if corporate parents are truly to embrace their responsibility to support CEYP and to expect the same outcomes for CEYP as they would want for their own children, then their corporate parenting role should be extended to include a 'corporate grandparenting' role, as suggested by the Centre for Social Justice (2015) and Roberts (2017).

The study also found high levels of teenage childbirth before age 18 among CEYP and a rapid increase in teenage childbirth among CEYP between age 16 and 18, with 19% of CEYP having a live birth before age 18 compared with 3% of CEYP having a live birth before age 16. This suggests that this may be an important age to consider when planning services for CEYP. Those ageing out of care around this time, for example, may be in particular need of support, particularly as early parenthood may be just one of many challenges care leavers face as they make the accelerated transition from care to independent living. Corporate parents should consider how best they can support young parents as they make both the transition from care and the transition to parenthood. The recent extension to the care leaving age in Scotland offers corporate parents greater opportunity to better support all care leavers, including those who are young parents, but effective support requires a clear understanding of CEYP's needs, adequate resourcing and effective implementation.

The pattern of risk observed for teenage abortion in the study was different from that observed for teenage childbirth, with only moderately higher levels of termination of pregnancy before age 20 observed among CEYP compared with their non-care experienced but similarly deprived peers. However, termination of pregnancy was still more common among CEYP than their non-care experienced peers and the general population. As such CEYP are also likely to have a greater need than their non-care experienced peers for support to prevent unintended teenage pregnancy. Corporate parents therefore have an important role to play in empowering CEYP to prevent unwanted teenage pregnancy, as well as supporting those who become young parents.

The teenage pregnancy estimates identified by the data linkage study in this thesis are important for understanding the teenage pregnancy related needs of CEYP in Fife. Taken alongside the views of CEYP, they can be used to plan services which meet the needs of CEYP. Given the lack of robust data on teenage pregnancy rates among CEYP in Scotland, and in particular the paucity of data on terminations of pregnancy among CEYP, the study's findings are also likely to be of interest to health boards and local authorities elsewhere in Scotland and further afield. As such, the data linkage study makes a useful contribution to the UK and international evidence base for teenage pregnancy among CEYP. Appendix 20 describes the dissemination plan for the study findings.

Finally, while the data linkage study was able to identify robust teenage pregnancy estimates for CEYP in Fife, undertaking the cross-sectoral data linkage was a challenging, time-consuming process. In its current form, the data linkage approach used is unlikely to be a practical way forward for NHS Fife and the Fife Corporate Parent Board to use to identify other health outcomes for CEYP in Fife. It is however a useful research tool.

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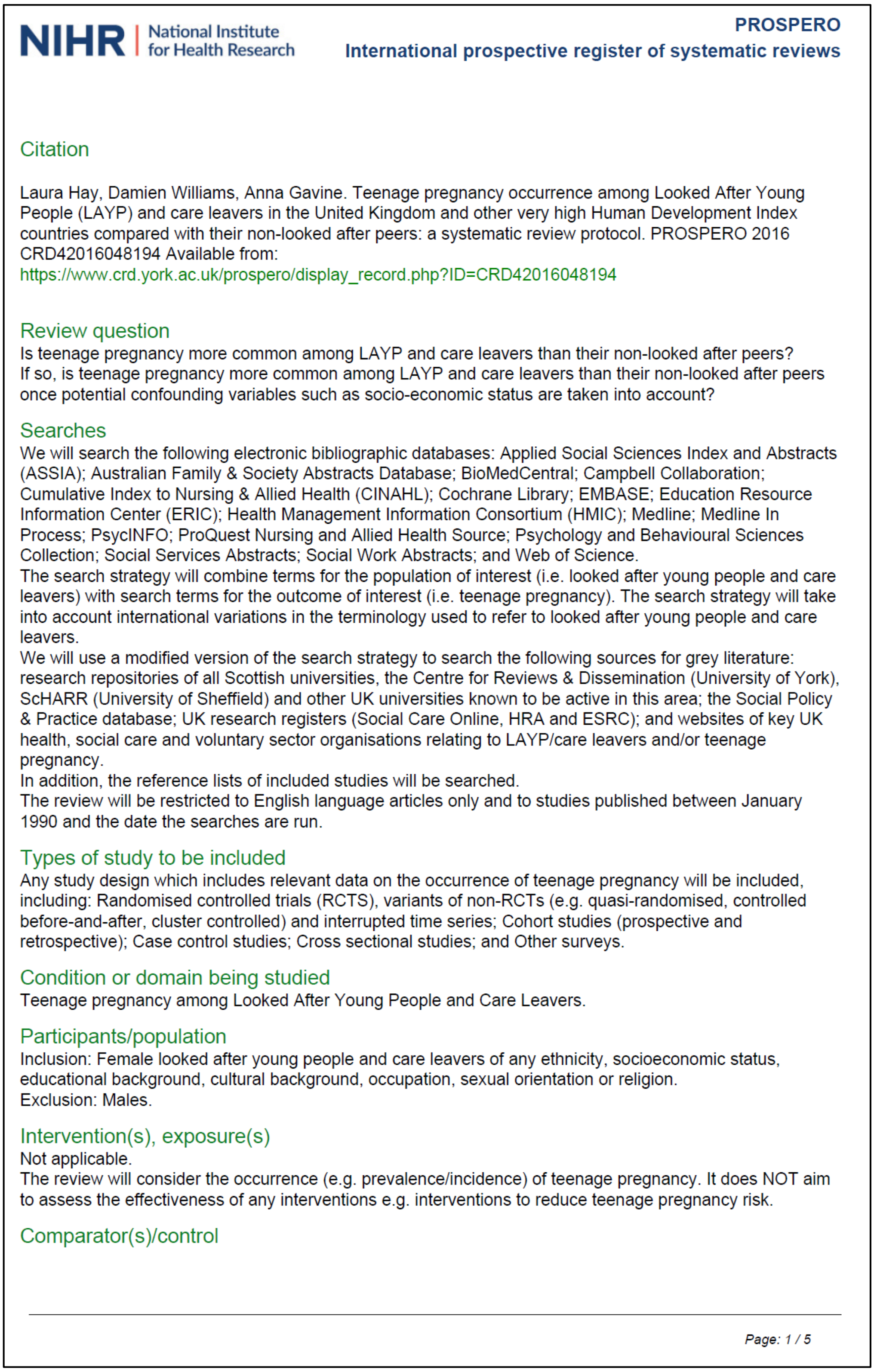
Appendices

Appendix 1: Systematic review protocol



National Institute for Health Research

PROSPERO
International prospective register of systematic reviews

Citation

Laura Hay, Damien Williams, Anna Gavine. Teenage pregnancy occurrence among Looked After Young People (LAYP) and care leavers in the United Kingdom and other very high Human Development Index countries compared with their non-looked after peers: a systematic review protocol. PROSPERO 2016 CRD42016048194 Available from:
https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42016048194

Review question

Is teenage pregnancy more common among LAYP and care leavers than their non-looked after peers?
If so, is teenage pregnancy more common among LAYP and care leavers than their non-looked after peers once potential confounding variables such as socio-economic status are taken into account?

Searches

We will search the following electronic bibliographic databases: Applied Social Sciences Index and Abstracts (ASSIA); Australian Family & Society Abstracts Database; BioMedCentral; Campbell Collaboration; Cumulative Index to Nursing & Allied Health (CINAHL); Cochrane Library; EMBASE; Education Resource Information Center (ERIC); Health Management Information Consortium (HMIC); Medline; Medline In Process; PsycINFO; ProQuest Nursing and Allied Health Source; Psychology and Behavioural Sciences Collection; Social Services Abstracts; Social Work Abstracts; and Web of Science.
The search strategy will combine terms for the population of interest (i.e. looked after young people and care leavers) with search terms for the outcome of interest (i.e. teenage pregnancy). The search strategy will take into account international variations in the terminology used to refer to looked after young people and care leavers.
We will use a modified version of the search strategy to search the following sources for grey literature: research repositories of all Scottish universities, the Centre for Reviews & Dissemination (University of York), ScHARR (University of Sheffield) and other UK universities known to be active in this area; the Social Policy & Practice database; UK research registers (Social Care Online, HRA and ESRC); and websites of key UK health, social care and voluntary sector organisations relating to LAYP/care leavers and/or teenage pregnancy.
In addition, the reference lists of included studies will be searched.
The review will be restricted to English language articles only and to studies published between January 1990 and the date the searches are run.

Types of study to be included

Any study design which includes relevant data on the occurrence of teenage pregnancy will be included, including: Randomised controlled trials (RCTS), variants of non-RCTs (e.g. quasi-randomised, controlled before-and-after, cluster controlled) and interrupted time series; Cohort studies (prospective and retrospective); Case control studies; Cross sectional studies; and Other surveys.

Condition or domain being studied

Teenage pregnancy among Looked After Young People and Care Leavers.

Participants/population

Inclusion: Female looked after young people and care leavers of any ethnicity, socioeconomic status, educational background, cultural background, occupation, sexual orientation or religion.
Exclusion: Males.

Intervention(s), exposure(s)

Not applicable.
The review will consider the occurrence (e.g. prevalence/incidence) of teenage pregnancy. It does NOT aim to assess the effectiveness of any interventions e.g. interventions to reduce teenage pregnancy risk.

Comparator(s)/control

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The review will only include studies which compare teenage pregnancy occurrence among LAYP and care leavers with that of their non-looked after peers. Studies which describe teenage pregnancy risk among LAYP and care leavers but do not compare this to a non-looked after comparator group will be excluded. Non-looked after comparator groups which will be considered acceptable include groups of young people who have never been looked after and general population groups (which will include a small proportion of young people who are or have been looked after). The review will state the type of comparison group used in each included study.

Context

• GEOGRAPHICAL SETTING:
The review will include the 49 countries considered by the Human Development Report Office as having "very high human development" based on Human Development Index (HDI) estimates for 2014. This includes the United Kingdom.
• CARE PLACEMENT SETTING:
All looked after care placement settings will be included (i.e. foster care, kinship care, residential care or looked after at home). International equivalents of the relevant care placement terms will be included.
• OTHER:
LAYP and care leavers will be included regardless of the reason for entering care with the exception of children in care for respite care purposes only (e.g. children with severe disabilities who receive short episodes of respite care to help their carers) who will be excluded.
LAYP and care leavers will be included regardless of the length of time spent in care or the reason for leaving care.

Main outcome(s)

The primary outcome of interest is the occurrence of teenage pregnancy.
Any measures of the occurrence of teenage pregnancy will be included, for instance:
• The rate of teenage pregnancy;
• Age at first pregnancy;
• Proportion pregnant by a specified age such as 16, 18 and 20 years of age; and
• Proportion pregnant within a certain time period e.g. within 6 months of leaving care.

Measures of effect

DEFINITION OF TEENAGE PREGNANCY:
For the purposes of this review, teenage pregnancy is defined as any pregnancy occurring among women aged under 20 years of age, regardless of the pregnancy outcome (i.e. termination, miscarriage or delivery).
SOURCES OF OUTCOME DATA: The following sources of teenage pregnancy outcome data will be accepted: Self-reported; Professional reported (e.g. social worker reported); Case records; and Routine/administrative health data.
The review will document the data source type used in each included study.

Additional outcome(s)

None.

Measures of effect

Not applicable.

Data extraction (selection and coding)

TITLE SCREENING: Titles of studies retrieved using the search strategy and those from additional sources will be screened by the first review author to identify studies that potentially meet the inclusion criteria outlined above. Titles will be screened using a very inclusive approach whereby obviously irrelevant titles will be excluded and titles that look relevant or titles where the relevance is unclear will go forward to the abstract screening stage.
ABSTRACT SCREENING: The abstracts of the studies remaining after the title screening stage will be reviewed independently by the first and second review authors to identify studies that potentially meet the inclusion criteria outlined above.
FULL TEXT REVIEW: The full text of potentially eligible studies remaining after the abstract screening stage will be retrieved and independently assessed for eligibility by the first and second review authors.
RESOLUTION OF DISAGREEMENTS: Any disagreement between the first and second review authors over

the eligibility of particular studies will be resolved through discussion with the third review author.
DATA EXTRACTION:
A standardised, pre-piloted form will be used to extract data from the included studies for assessment of study quality and evidence synthesis. Data will be extracted using the Joanna Briggs Institute Data Extraction Form for Prevalence and Incidence Studies (The Joanna Briggs Institute 2014).
Extracted information will include: aims of the study; study setting; study design; follow up or study duration; subject characteristics; dependent variable; outcomes; outcome measurements; ethical approval; method of data analysis; results; and information for assessment of the risk of bias.
Data will be extracted by the first review author and then checked by the second review author.
Discrepancies will be identified and resolved through discussion (with the third review author where necessary).
MISSING DATA: Missing data will be requested from study authors.
MULTIPLE REPORTS: Multiple reports of the same study will be collated so that each study (rather than each paper) forms the “unit of interest” in the review.

Risk of bias (quality) assessment

The quality of studies will be assessed by the first review author and checked by the second review author.
Studies will be assessed using the Joanna Briggs Institute Critical Appraisal Checklist for Studies Reporting Prevalence Data (The Joanna Briggs Institute 2014). Studies will be grouped into high or low methodological quality as appropriate.
The appraisal of each study will ask the following questions: Was the sample representative of the target population?; Were study participants recruited in an appropriate way?; Was the sample size adequate?; Were the study subjects and the setting described in detail?; Was the data analysis conducted with sufficient coverage of the identified sample?; Were objective, standard criteria used for the measurement of the condition?; Was the condition measured reliably?; Was there appropriate statistical analysis?; Are all important confounding factors/subgroups/differences identified and accounted for?; and were subpopulations identified using objective criteria?
Discrepancies will be identified and resolved through discussion (with the third review author where necessary).

Strategy for data synthesis

If sufficiently similar studies are available, the studies will be pooled in a meta-analysis. Each outcome (listed above) will be analysed separately. For studies with dichotomous data (e.g. number of pregnancies before age 20) a pooled OR/RR will be calculated with a 95% confidence interval. For continuous data (e.g. age at first pregnancy) the mean difference will be used. We will assess statistical heterogeneity by performing a Chi-squared test and examining the I-squared statistic. Levels of heterogeneity will be reported.
Where statistical pooling is not possible, the findings will be presented in narrative form including tables, graphs and figures as appropriate to aid data presentation.

Analysis of subgroups or subsets

If the necessary data are available, subgroup analyses by factors such as placement type will be conducted to examine magnitudes of effect in different groups.

Contact details for further information

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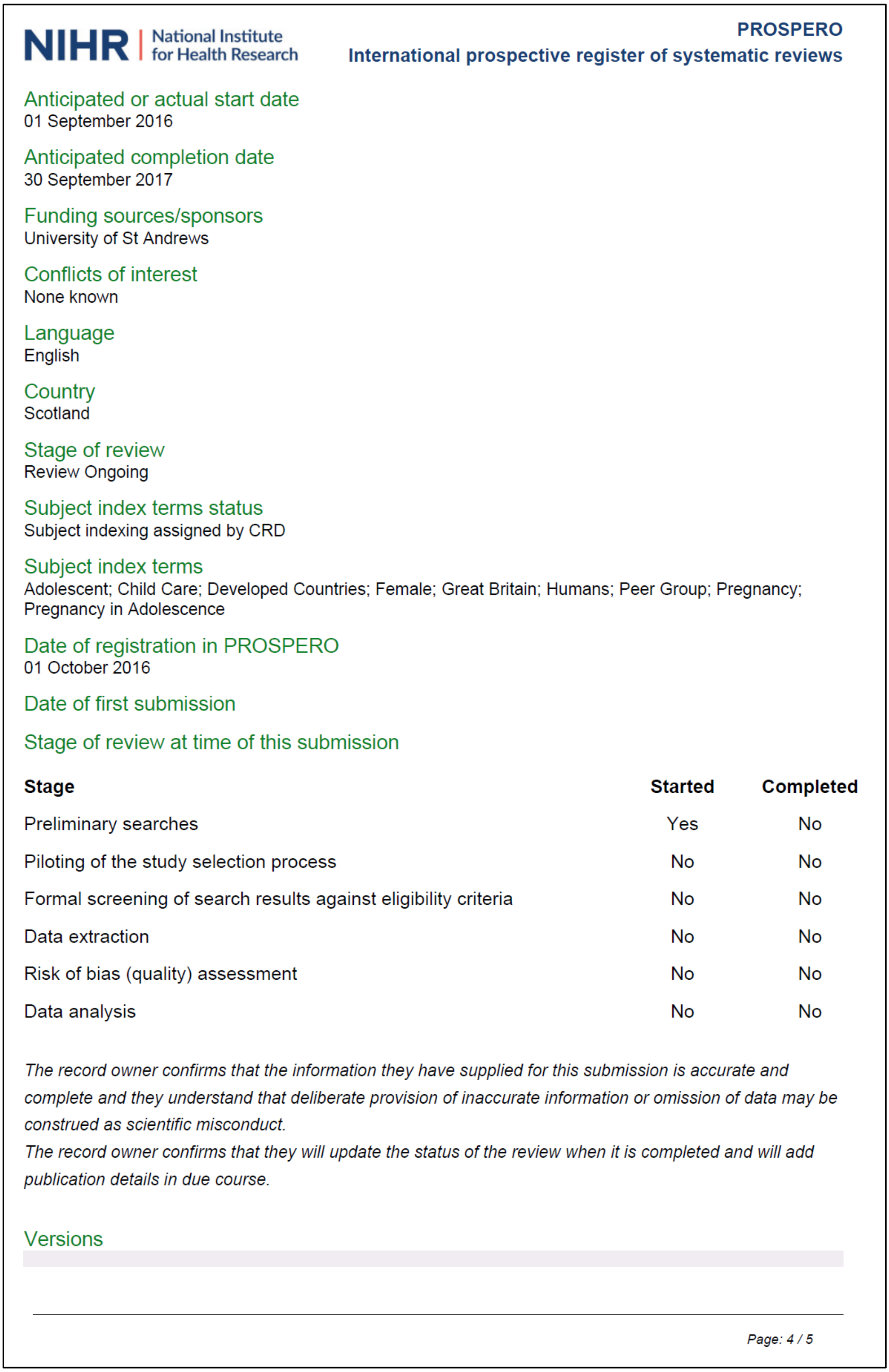
Review team members and their organisational affiliations

Dr Laura Hay. University of St Andrews
Dr Damien Williams. University of St Andrews
Dr Anna Gavine. University of Dundee

Type and method of review

Epidemiologic, Systematic review



Anticipated or actual start date
01 September 2016

Anticipated completion date
30 September 2017

Funding sources/sponsors
University of St Andrews

Conflicts of interest
None known

Language
English

Country
Scotland

Stage of review
Review Ongoing

Subject index terms status
Subject indexing assigned by CRD

Subject index terms
Adolescent; Child Care; Developed Countries; Female; Great Britain; Humans; Peer Group; Pregnancy; Pregnancy in Adolescence

Date of registration in PROSPERO
01 October 2016

Date of first submission

Stage of review at time of this submission

Stage	**Started**	**Completed**
Preliminary searches	Yes	No
Piloting of the study selection process	No	No
Formal screening of search results against eligibility criteria	No	No
Data extraction	No	No
Risk of bias (quality) assessment	No	No
Data analysis	No	No

The record owner confirms that the information they have supplied for this submission is accurate and complete and they understand that deliberate provision of inaccurate information or omission of data may be construed as scientific misconduct.
The record owner confirms that they will update the status of the review when it is completed and will add publication details in due course.

Versions

Appendix 2: Systematic review grey literature searches

SOURCE	SEARCH TERMS	SEARCH DATES
Research repositories of Scottish universities		
Abertay University, Research Portal <https://rke.abertay.ac.uk/en/>	• teen* pregnan*	11/10/17 & 11/2/21
Edinburgh Napier University, Repository <http://www.napier.ac.uk/research-and-innovation/repository>	• teenage pregnancy	11/10/17 & 11/2/21
Glasgow Caledonian University, ResearchOnline@GCU • <http://researchonline.gcu.ac.uk/portal/> (searched 11/10/17) • <https://researchonline.gcu.ac.uk/en/> (searched 11/2/21)	• teen* pregnan*	11/10/17 & 11/2/21
Heriot-Watt University, Research Portal <https://researchportal.hw.ac.uk/en/home/index/>	• teenage pregnancy	11/10/17 & 11/2/21
Queen Margaret University, eResearch <http://eresearch.qmu.ac.uk/>	• teen* pregnan*	11/10/17 & 11/2/21
Robert Gordon University, Open Access Institutional Repository (OpenAIR@RGU) • <https://openair.rgu.ac.uk/> (searched 11/10/17) • <https://rgu-repository.worktribe.com/> (searched 11/2/21)	• teen* pregnan*	11/10/17 & 11/2/21
University of Aberdeen, Aberdeen University Research Archive <http://aura.abdn.ac.uk/>	• teen* pregnan*	11/10/17 & 11/2/21
University of Dundee, Discovery Research Portal • <http://discovery.dundee.ac.uk/portal/> (searched 11/10/17)	• teen* pregnan*	11/10/17 & 11/2/21

SOURCE	SEARCH TERMS	SEARCH DATES
• <https://discovery.dundee.ac.uk/> (searched 11/2/21)		
University of Edinburgh, Edinburgh Research Archive • <https://www.era.lib.ed.ac.uk/> (searched 11/10/17) • <https://era.ed.ac.uk/> (searched 11/2/21)	• teen* pregnan*	11/10/17 & 11/2/21
University of Edinburgh, Edinburgh Research Explorer <http://www.research.ed.ac.uk/portal/en/>	• teen* pregnan*	11/10/17 & 11/2/21
University of Glasgow, Enlighten <https://www.gla.ac.uk/research/enlighten/>	• teenage pregnancy	25/10/17 & 11/2/21
University of St Andrews, Research Repository <https://research-repository.st-andrews.ac.uk/>	• teenage AND pregnancy	25/10/17 & 11/2/21
University of Stirling, Stirling Online Research Repository <https://dspace.stir.ac.uk/>	• teenage AND pregnancy	25/10/17 & 11/2/21
University of Strathclyde, Strathprints <https://strathprints.strath.ac.uk/>	• teenage pregnancy	25/10/17 & 11/2/21
University of the Highlands & Islands, Research Database • <https://pure.uhi.ac.uk/portal/en/> (searched 25/10/17) • <https://pure.uhi.ac.uk/en/> (searched 11/2/21)	• pregnancy	25/10/17 & 11/2/21
University of the West of Scotland, Research Portal • <http://research-portal.uws.ac.uk/portal/en/publications/search.html> (searched 25/10/17)	• teenage AND pregnancy	25/10/17 & 11/2/21

SOURCE	SEARCH TERMS	SEARCH DATES
- <https://research-portal.uws.ac.uk/en/publications/> (searched 11/2/21)		
Research repositories of universities elsewhere in the UK known to be active in the field of teenage pregnancy and/or CEYP research		
Lancaster University, Research Directory <http://www.research.lancs.ac.uk/portal/>	- teen* pregnan*	25/10/17 & 11/2/21
Loughborough University, Institutional Repository - <https://dspace.lboro.ac.uk/dspace-jspui/> (searched 25/10/17) - <https://repository.lboro.ac.uk/> (searched 11/2/21)	- teen* pregnan*	25/10/17 & 11/2/21
Oxford University, Research Archive <https://ora.ox.ac.uk/>	- teen* pregnan*	25/10/17 & 11/2/21
University of Bedfordshire, Repository <http://uobrep.openrepository.com/uobrep/>	- "teenage pregnancy" - "looked after"	12/11/17 & 11/2/21
White Rose Research Online (a shared repository of the Universities of Leeds, Sheffield and York) <http://eprints.whiterose.ac.uk/>	- teenage pregnancy	25/10/17 & 11/2/21
Other UK research repositories/registers		
Centre for Reviews & Dissemination, University of York <https://www.crd.york.ac.uk/CRDWeb/>	- teenage AND pregnancy	25/10/17 & 12/2/21

SOURCE	SEARCH TERMS	SEARCH DATES
Economic and Social Research Council research catalogue • <http://www.researchcatalogue.esrc.ac.uk/> (searched 25/10/17) • February 2021: Economic and Social Research Council included as part of Gateway to Research search below	• teenage AND pregnancy • “looked after children” • “looked after young people” • "care leavers" • LAC • LAYP	25/10/17
Health Research Authority research summaries • <http://www.hra.nhs.uk/news/research-summaries/> (searched 25/10/17) • <https://www.hra.nhs.uk/planning-and-improving-research/application-summaries/research-summaries/> (searched 12/2/21)	• "teenage pregnancy" • "looked after children" • “looked after young people" • "care leavers" • LAYP	25/10/17 & 12/2/21
Research Councils UK Gateway to Research • <http://gtr.rcuk.ac.uk/> (searched 25/10/17) • <https://gtr.ukri.org/> (searched 12/2/21)	• teenage AND pregnancy	25/10/17 & 12/2/21
Health and social care related organisations		
British Association of Social Workers <https://www.basw.co.uk/resources/>	• teenage pregnancy	9/11/17 & 12/2/21
Campbell Collaboration • <https://www.campbellcollaboration.org/library.html> (searched 9/11/17) • <https://www.campbellcollaboration.org/> (searched 12/2/21)	• teenage pregnancy • looked after	9/11/17 & 12/2/21
Community Care	• “teenage pregnancy”	9/11/17

SOURCE	**SEARCH TERMS**	**SEARCH DATES**
<http://www.communitycare.co.uk/>		& 12/2/21
Glasgow Centre for Population Health <http://www.gcph.co.uk/publications>	• looked after • pregnancy	29/10/17 & 12/2/21
Institute for Research and Innovation in Social Services <https://www.iriss.org.uk/resources>	• “teenage pregnancy”	7/11/17 & 12/2/21
Joseph Rowntree Foundation <https://www.jrf.org.uk/>	• “teenage pregnancy” • “looked after”	29/10/17 & 12/2/21
National Institute for Health and Care Excellence <https://www.nice.org.uk/>	• “teenage pregnancy”	8/11/17 & 12/2/21
	• “looked after”	9/11/17 & 12/2/21
Scottish Government Publications • <http://www.gov.scot/Publications/Recent> (searched 25/10/17) • <https://www.gov.scot/publications/> (searched 12/2/21)	• "teenage pregnancy" AND "looked after"	25/10/17 & 12/2/21
Scottish Public Health Network <https://www.scotphn.net/>	• teenage pregnancy • looked after	25/10/17 & 12/2/21
Scottish Public Health Observatory <http://www.scotpho.org.uk/>	• pregnancy	25/10/17 & 12/2/21†
Social Work Scotland • <http://www.socialworkscotland.org/what-we-do/resources/> (searched 9/11/17) • February 2021: Not searched due to lack of search functionality on website	• pregnancy • looked after	9/11/17
The King’s Fund <https://www.kingsfund.org.uk/publications>	• “teenage pregnancy” • “looked after”	1/11/17 & 12/2/21
The Nuffield Trust	• teenage pregnancy	16/11/17

SOURCE	**SEARCH TERMS**	**SEARCH DATES**
<https://www.nuffieldtrust.org.uk/research>	• looked after	& 12/2/21
World Health Organisation Institutional Repository for Information Sharing <http://apps.who.int/iris/>	• "pregnancy" AND "foster care" • "pregnancy" AND "out of home care" • "pregnancy" AND "care leaver" • "pregnancy" AND "leaving care"	16/11/17 & 12/2/21
Children's organisations		
Australian Institute of Family Studies <https://aifs.gov.au/publications>	"Out-of-home-care" and "Leaving care" sections of publications searched	12/11/17 & 14/2/21
Barnardo's • <http://www.barnardos.org.uk/what_we_do/policy_research_unit/research_and_publications.htm> (searched 12/11/17) • <https://www.barnardos.org.uk/> (searched 14/2/21)	• pregnancy	12/11/17 & 14/2/21†
Children and Young People's Commissioner Scotland <https://www.cypcs.org.uk/>	• teenage pregnancy	9/11/17 & 14/2/21
Children's Parliament <http://www.childrensparliament.org.uk/>	• pregnancy • looked after	9/11/17 & 14/2/21
National Children's Bureau <https://www.ncb.org.uk/>	• teenage pregnancy • looked after	9/11/17 & 14/2/21
National Society for the Prevention of Cruelty to Children	• "teenage pregnancy"	9/11/17 & 14/2/21

SOURCE	SEARCH TERMS	SEARCH DATES
<https://www.nspcc.org.uk/services-and-resources/research-and-resources/search-library/> (searched 9/11/17) <https://learning.nspcc.org.uk/services/library-catalogue> (searched 14/2/21)		
Research in Practice <https://www.rip.org.uk/resources/publications/> (searched 9/11/17) <https://www.researchinpractice.org.uk/children/publications/> (searched 14/2/21)	teenage pregnancy	9/11/17 & 14/2/21
Royal College of Paediatrics and Child Health <https://www.rcpch.ac.uk/>	"teenage pregnancy" “looked after”	12/11/17 & 14/2/21†
LAC & care leaver organisations		
Aberlour Child Care Trust <http://www.aberlour.org.uk/>	pregnancy	12/11/17 & 14/2/21
Centre for Excellence for Looked After Children in Scotland <https://www.celcis.org/knowledge-bank/search-bank/>	teenage pregnancy	12/11/17 & 14/2/21
CoramBAAF <https://corambaaf.org.uk/>	pregnancy	12/11/17 & 14/2/21†
Scottish Throughcare and Aftercare Forum <http://www.staf.scot/>	“STAF resources” and “Research from the Sector” webpages searched	12/11/17
	teenage pregnancy “Health” section of “Policy Areas” section within “Policy &	14/2/21†

SOURCE	SEARCH TERMS	SEARCH DATES
	Resources" section searched	
The Fostering Network <https://www.thefosteringnetwork.org.uk/>	- pregnancy	12/11/17 & 14/2/21†
Voice of Young People in Care <http://www.voypic.org/>	- teenage pregnancy	12/11/17 & 14/2/21†

†The searches undertaken in February 2021 were limited to results from 2017 onwards except for the following where it was not possible to limit the search by date: Barnardo's; CoramBAAF; Royal College of Paediatrics and Child Health; Scottish Public Health Observatory; Scottish Throughcare and Aftercare Forum; The Fostering Network; and Voice of Young People in Care.

Appendix 3: Systematic review database search strategies

ASSIA (1987 - current) searched via ProQuest on 29/1/17 and search rerun on 1/1/21 (with rerun limited to 1st January 2017 onwards)

((SU.EXACT("Abortion") OR abortion* OR SU.EXACT("Adolescent parenthood") OR (adolescen* AND mother*) OR (adolescen* AND parent*) OR SU.EXACT("Miscarriages") OR SU.EXACT("Pregnancy") OR pregnan* OR SU.EXACT("Reproductive health") OR ("sexual behavior" OR "sexual behaviour" OR "sexual health" OR "sexual risk") OR (teen* conception*) OR (teen* mother* OR teen* mum* OR teen* parent*)) AND (("adopted child" OR "adopted children" OR adoptee*) OR ("aging out" OR "ageing out") OR "alternative family care" OR ("care leaver" OR "care leavers") OR "children in care" OR SU.EXACT("Foster care") OR ("foster care" OR "foster home" OR "foster placement" OR "foster placements") OR "foster youth" OR "group care" OR "kinship care" OR "leaving care" OR "local authority care" OR "looked after" OR SU.EXACT("Out of home care") OR ("out of home care" OR "out of home placement") OR "public care" OR "residential child care" OR "state care" OR "substitute care")) AND la.exact("English")Limits applied

CINAHL Plus with Full Text searched via EBSCOhost on 23/1/17 and search rerun on 1/1/21 (with rerun limited to 1st January 2017 onwards)

S1	(MH "Child, Adopted")
S2	adopted child*
S3	adoptee*
S4	aging out
S5	ageing out
S6	"alternative family care"
S7	care leav*
S8	children* home
S9	"children in care"
S10	"foster care"
S11	(MH "Child, Foster")

S12 (MH "Foster Home Care")

S13 foster place*

S14 "foster youth"

S15 "group care"

S16 "kinship care"

S17 LACYP

S18 LAYP

S19 "leaving care"

S20 "local authority care"

S21 "looked after"

S22 "out of home care"

S23 out of home place*

S24 "public care"

S25 "residential child care"

S26 "state care"

S27 "substitute care"

S28 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27

S29 (MH "Abortion, Induced")

S30 (MH "Abortion, Spontaneous")

S31 abortion*

S32 (MH "Adolescent Mothers")

S33 (MH "Adolescent Parents+")

S34 (MH "Maternal Age 14 and Under")

S35 (MH "Pregnancy")

S36 pregnan*

S37 (MH "Pregnancy in Adolescence+")

S38 (MH "Reproductive Health")

S39 (MH "Sexual Health")

S40 "sexual behavior"

S41 "sexual behaviour"

S42 "sexual health"

S43 "sexual risk"

S44 teen* conception

S45 teen* mother*

S46 teen* mum*

S47 teen* parent*

S48 "termination of pregnancy"

S49 S29 OR S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36 OR S37 OR S38 OR S39 OR S40 OR S41 OR S42 OR S43 OR S44 OR S45 OR S46 OR S47 OR S48

S50 S28 AND S49

S51 S28 AND S49 Limiters - Published Date: 19900101-20170131; English Language

Cochrane Library searched via Wiley on 24/1/17 and search rerun on 1/1/21 (with rerun limited to January 2017 onwards)

#1 MeSH descriptor: [Adoption] explode all trees

#2 "aging out" or "ageing out"

#3 "alternative family care"

#4 "care leaver" or "care leavers" or "leaving care"

#5 "children in care"

#6 MeSH descriptor: [Foster Home Care] explode all trees

#7 "foster youth"

#8 MeSH descriptor: [Group Homes] explode all trees

#9 "kinship care"

#10 "local authority care"

#11 "looked after"

#12 "out of home care" or "out of home placement" or "out of home placements"

#13 "public care"
#14 "state care"
#15 "substitute care"
#16 {or #1-#15}
#17 MeSH descriptor: [Abortion, Induced] explode all trees
#18 MeSH descriptor: [Abortion, Spontaneous] explode all trees
#19 abortion*
#20 adolescen* next mother*
#21 adolescen* next parent*
#22 MeSH descriptor: [Pregnancy] explode all trees
#23 MeSH descriptor: [Pregnancy in Adolescence] explode all trees
#24 pregnan*
#25 MeSH descriptor: [Reproductive Health] explode all trees
#26 MeSH descriptor: [Sexual Behavior] explode all trees
#27 "sexual behavior" or "sexual behaviour" or "sexual health" or "sexual risk"
#28 teen* next conception*
#29 (teen* next mother*) or (teen* next mum*) or (teen* next parent*)
#30 {or #17-#29}
#31 #16 and #30
#32 #31 Publication Year from 1990 to 2017

EMBASE (1974 to 2017 January 16) searched via Ovid on 17/1/17 and search rerun on 2/1/21 using EMBASE (1974 to 2020 December 31) with rerun limited to 2017 onwards

1 adopted child/
2 (adopted child* or adoptee*).mp.
3 (aging out or ageing out).mp.
4 alternative family care.mp.
5 (care leav* or leaving care).mp.
6 child* in care.mp.

7 children* home.mp.

8 foster care.mp. or foster care/

9 foster child*.mp.

10 foster home*.mp.

11 foster place*.mp.

12 foster youth.mp.

13 group care.mp.

14 limit 13 to (infant <to one year> or child <unspecified age> or preschool child <1 to 6 years> or school child <7 to 12 years> or adolescent <13 to 17 years>)

15 kinship care.mp.

16 ("LAYP" or "LACYP").mp.

17 local authority care.mp.

18 "looked after".mp.

19 out of home care.mp.

20 out of home placement*.mp.

21 public care.mp.

22 limit 21 to (infant <to one year> or child <unspecified age> or preschool child <1 to 6 years> or school child <7 to 12 years> or adolescent <13 to 17 years>)

23 residential care.mp. or residential care/

24 limit 23 to (infant <to one year> or child <unspecified age> or preschool child <1 to 6 years> or school child <7 to 12 years> or adolescent <13 to 17 years>)

25 (secure adj (unit* or home* or accom*)).mp.

26 limit 25 to (infant <to one year> or child <unspecified age> or preschool child <1 to 6 years> or school child <7 to 12 years> or adolescent <13 to 17 years>)

27 state care.mp.

28 substitute care.mp.

29 (supervision adj (requirement or order*)).mp.

30 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 22 or 24 or 26 or 27 or 28 or 29

31 abortion/

32 abortion*.mp.

33 adolescent mother/

34 (adolescen* and mother*).mp.
35 adolescent parent/
36 (adolescen* and parent*).mp.
37 adolescent pregnancy/
38 pregnancy/
39 pregnan*.mp.
40 pregnancy termination/
41 reproductive health/
42 sexual behavior/
43 sexual health/
44 ("sexual behavior" or "sexual behaviour" or "sexual health" or "sexual risk").mp.
45 teen* conception.mp.
46 (teen* mother* or teen* mum* or teen* parent*).mp.
47 termination of pregnancy.mp.
48 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47
49 30 and 48
50 limit 49 to english language
51 limit 50 to yr="1990 -Current"

ERIC (1965 to October 2016) searched via Ovid on 17/1/17 and search rerun on 3/1/21 using ERIC (1965 to September 2020) with rerun limited to 2016 onwards

1 (adopted child* or adoptee*).mp.
2 (aging out or ageing out).mp.
3 alternative family care.mp.
4 (care leav* or leaving care).mp.
5 child* in care.mp.
6 family group homes.mp.
7 exp Foster Care/
8 foster child*.mp.
9 foster home*.mp.
10 foster place*.mp.

11 foster youth.mp.
12 group care.mp.
13 exp Group Homes/
14 kinship care.mp.
15 ("LAYP" or "LACYP").mp.
16 local authority care.mp.
17 looked after.mp.
18 out of home care.mp.
19 out of home placement*.mp.
20 public care.mp.
21 residential care.mp. or exp Residential Care/
22 residential unit*.mp.
23 (secure adj (unit* or home* or accom*)).mp.
24 state care.mp.
25 substitute care.mp.
26 (supervision adj (requirement or order*)).mp.
27 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26
28 abortion*.mp.
29 (adolescen* and mother*).mp.
30 (adolescen* and parent*).mp.
31 exp Early Parenthood/
32 exp Pregnancy/
33 pregnan*.mp.
34 reproductive health.mp.
35 (sexual behavior or sexual behaviour or sexual health or sexual risk).mp.
36 exp Sexuality/
37 teen* conception.mp.
38 (teen* mother* or teen* mum* or teen* parent*).mp.
39 termination of pregnancy.mp.
40 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39
41 27 and 40

42 limit 41 to english language

43 limit 42 to yr="1990 -Current"

HMIC (1979 to November 2016) searched via Ovid on 17/1/17 and search rerun on 2/1/21 using HMIC (1979 to November 2020) with rerun limited to 2016 onwards

1 exp Adoption/

2 exp Adopted children/

3 (adopted child* or adoptee*).mp.

4 (aging out or ageing out).mp.

5 alternative family care.mp.

6 exp Care leavers/

7 (care leav* or leaving care).mp.

8 exp Children in care/

9 child* in care.mp.

10 children* home.mp.

11 family group homes.mp. or exp Family group homes/

12 foster care.mp. or exp Foster care/

13 foster child*.mp.

14 foster home*.mp.

15 foster place*.mp.

16 foster youth.mp.

17 group care.mp.

18 kinship care.mp. or exp Kinship care/

19 ("LAYP" or "LACYP").mp.

20 local authority care.mp.

21 looked after.mp.

22 (out of home care or out of home placement*).mp.

23 public care.mp.

24 exp Residential child care/

25 (secure adj (unit* or home* or accom*)).mp.

26 state care.mp.

27 substitute care.mp. or exp Substitute care/

28 (supervision adj (requirement or order*)).mp.

29 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28

30 abortion*.mp.

31 (adolescen* and mother*).mp.

32 (adolescen* and parent*).mp.

33 exp Pregnancy/

34 pregnan*.mp.

35 exp Pregnancy outcome/

36 exp Sexual behaviour/

37 exp Sexual health/

38 (sexual behavior or sexual behaviour or sexual health or sexual risk).mp.

39 teen* conception.mp.

40 (teen* mother* or teen* mum* or teen* parent*).mp.

41 termination of pregnancy.mp.

42 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41

43 29 and 42

44 limit 43 to yr="1990 -Current"

MEDLINE (Ovid MEDLINE(R) 1946 to Present with Daily Update) searched via Ovid on 17/1/17 and search rerun on 2/1/21 using Ovid MEDLINE(R)ALL <1946 to December 31, 2020> with rerun limited to 2017 onwards

1 (adopted child* or adoptee*).mp.

2 ("aging out" or "ageing out").mp.

3 alternative family care.mp.

4 (care leav* or leaving care).mp.

5 child* in care.mp.

6 children* home.mp.

7 foster care.mp.

8 foster child*.mp.

9 Foster Home Care/

10 foster place*.mp.

11 foster youth.mp.
12 group care.mp.
13 limit 12 to ("newborn infant (birth to 1 month)" or "infant (1 to 23 months)" or "preschool child (2 to 5 years)" or "child (6 to 12 years)" or "adolescent (13 to 18 years)")
14 Group Homes/
15 limit 14 to ("newborn infant (birth to 1 month)" or "infant (1 to 23 months)" or "preschool child (2 to 5 years)" or "child (6 to 12 years)" or "adolescent (13 to 18 years)")
16 kinship care.mp.
17 ("LAYP" or "LACYP").mp.
18 local authority care.mp.
19 looked after.mp.
20 out of home care.mp.
21 out of home placement*.mp.
22 public care.mp.
23 residential care.mp.
24 limit 23 to ("newborn infant (birth to 1 month)" or "infant (1 to 23 months)" or "preschool child (2 to 5 years)" or "child (6 to 12 years)" or "adolescent (13 to 18 years)")
25 residential center*.mp.
26 residential unit*.mp.
27 (secure adj (unit* or home* or accom*)).mp.
28 limit 27 to ("newborn infant (birth to 1 month)" or "infant (1 to 23 months)" or "preschool child (2 to 5 years)" or "child (6 to 12 years)" or "adolescent (13 to 18 years)")
29 state care.mp.
30 substitute care.mp.
31 (supervision adj (requirement or order*)).mp.
32 limit 31 to ("newborn infant (birth to 1 month)" or "infant (1 to 23 months)" or "preschool child (2 to 5 years)" or "child (6 to 12 years)" or "adolescent (13 to 18 years)")

33 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 13 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 24 or 25 or 26 or 28 or 29 or 30 or 32
34 Abortion, Induced/
35 Abortion, Spontaneous/
36 abortion*.mp.
37 Pregnancy/
38 pregnan*.mp.
39 Pregnancy in Adolescence/
40 Reproductive Health/
41 Sexual Behavior/
42 ("sexual behavior" or "sexual behaviour" or "sexual health" or "sexual risk").mp.
43 teen* conception.mp.
44 (teen* mother* or teen* mum* or teen* parent*).mp.
45 termination of pregnancy.mp.
46 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45
47 33 and 46
48 limit 47 to english language
49 limit 48 to yr="1990 -Current"

MIDIRS (Maternity and Infant Care) searched via Ovid on 17/1/17 and search rerun on 2/1/21 (with rerun limited to 2017 onwards)

1 Adoption.de.
2 (adopted child* or adoptee*).mp.
3 alternative family care.mp.
4 (aging out or ageing out).mp.
5 (care leav* or leaving care).mp.
6 child* in care.mp.
7 children* home.mp.
8 Foster home care.de. or foster care.mp.
9 foster child*.mp.
10 foster home*.mp.
11 foster place*.mp.

12 foster youth.mp.

13 group homes.mp.

14 kinship care.mp.

15 local authority care.mp.

16 looked after.mp.

17 ("LAYP" or "LACYP").mp.

18 (out of home care or out of home placement*).mp.

19 public care.mp.

20 residential care.mp.

21 (secure adj (unit* or home* or accom*)).mp.

22 state care.mp.

23 substitute care.mp.

24 (supervision adj (requirement or order*)).mp.

25 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24

26 Abortion.de.

27 Abortion - induced.de.

28 Abortion - spontaneous.de.

29 abortion*.mp.

30 (adolescen* and mother*).mp.

31 (adolescen* and parent*).mp.

32 Miscarriage.de.

33 Pregnancy.de.

34 Pregnancy in adolescence.de.

35 Pregnancy outcome.de.

36 pregnan*.mp.

37 Reproductive health.de.

38 Sexual Behavior.de.

39 Sexual health.de.

40 (sexual behavior or sexual behaviour or sexual health or sexual risk).mp.

41 teen* conception.mp.

42 (teen* mother* or teen* mum* or teen* parent*).mp.

43 teenage pregnancy.mp. or Teenage pregnancy.de.

44 termination of pregnancy.mp.

45 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44

46 25 and 45

47 limit 46 to yr="1990 -Current"

PreMEDLINE (Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations January 16, 2017) searched via Ovid on 17/1/17. Search not updated in January 2021 due to database access issues.

1 (adopted child* or adoptee*).mp.

2 ("aging out" or "ageing out").mp.

3 alternative family care.mp.

4 (care leav* or leaving care).mp.

5 child* in care.mp.

6 children* home.mp.

7 foster care.mp.

8 foster child*.mp.

9 Foster Home Care/

10 foster place*.mp.

11 foster youth.mp.

12 group care.mp.

13 limit 12 to ("newborn infant (birth to 1 month)" or "infant (1 to 23 months)" or "preschool child (2 to 5 years)" or "child (6 to 12 years)" or "adolescent (13 to 18 years)")

14 Group Homes/

15 limit 14 to ("newborn infant (birth to 1 month)" or "infant (1 to 23 months)" or "preschool child (2 to 5 years)" or "child (6 to 12 years)" or "adolescent (13 to 18 years)")

16 kinship care.mp.

17 ("LAYP" or "LACYP").mp.

18 local authority care.mp.

19 looked after.mp.

20 out of home care.mp.

21 out of home placement*.mp.

22 public care.mp.

23 residential care.mp.

24 limit 23 to ("newborn infant (birth to 1 month)" or "infant (1 to 23 months)" or "preschool child (2 to 5 years)" or "child (6 to 12 years)" or "adolescent (13 to 18 years)")

25 residential center*.mp.

26 residential unit*.mp.

27 (secure adj (unit* or home* or accom*)).mp.

28 limit 27 to ("newborn infant (birth to 1 month)" or "infant (1 to 23 months)" or "preschool child (2 to 5 years)" or "child (6 to 12 years)" or "adolescent (13 to 18 years)")

29 state care.mp.

30 substitute care.mp.

31 (supervision adj (requirement or order*)).mp.

32 limit 31 to ("newborn infant (birth to 1 month)" or "infant (1 to 23 months)" or "preschool child (2 to 5 years)" or "child (6 to 12 years)" or "adolescent (13 to 18 years)")

33 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 13 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 24 or 25 or 26 or 28 or 29 or 30 or 32

34 Abortion, Induced/

35 Abortion, Spontaneous/

36 abortion*.mp.

37 Pregnancy/

38 pregnan*.mp.

39 Pregnancy in Adolescence/

40 Reproductive Health/

41 Sexual Behavior/

42 ("sexual behavior" or "sexual behaviour" or "sexual health" or "sexual risk").mp.

43 teen* conception.mp.

44 (teen* mother* or teen* mum* or teen* parent*).mp.
45 termination of pregnancy.mp.
46 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45
47 33 and 46
48 limit 47 to english language
49 limit 48 to yr="1990 -Current"

Psychology and Behavioural Sciences Collection searched via EBSCOhost on 23/1/17 and search rerun on 1/1/21 (with rerun limited to January 2017 onwards)

S1 adopted child* OR adoptee*
S2 "aging out" OR "ageing out"
S3 "alternative family care"
S4 care leav* OR leaving care
S5 "children in care"
S6 "foster care"
S7 foster place*
S8 "foster youth"
S9 "group care"
S10 "kinship care"
S11 "LAYP" OR "LACYP"
S12 "local authority care"
S13 "looked after"
S14 "out of home care"
S15 out of home place*
S16 "public care"
S17 "residential child care"
S18 "state care"
S19 "substitute care"
S20 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19
S21 abortion*
S22 adolescen* mother*

S23 adolescen* parent*
S24 pregnan*
S25 "sexual behavior" OR "sexual behaviour" OR "sexual health" OR "sexual risk"
S26 teen* conception
S27 teen* mother* OR teen* mum* OR teen* parent*
S28 "termination of pregnancy"
S29 S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28
S30 S20 AND S29
S31 S30 Limiters - Published Date: 19900101-20170131

PsycINFO searched via EBSCOhost on 23/1/17 and search rerun on 1/1/21 (with rerun limited to January 2017 onwards)

S1 DE "Adoption (Child)"
S2 DE "Adopted Children"
S3 DE "Adoptees"
S4 adopted child* OR adoptee*
S5 "ageing out" OR "aging out"
S6 "alternative family care"
S7 care leav* OR leaving care
S8 "children in care"
S9 DE "Foster Care" OR DE "Foster Children"
S10 "foster care"
S11 foster place*
S12 "foster youth"
S13 DE "Group Homes" Limiters - Age Groups: Childhood (birth-12 yrs), Adolescence (13-17 yrs), Young Adulthood (18-29 yrs)
S14 "kinship care"
S15 "LAYP" OR "LACYP"
S16 "local authority care"
S17 "looked after"
S18 out of home care OR out of home place*

S19 "public care" Limiters - Age Groups: Childhood (birth-12 yrs), Adolescence (13-17 yrs), Young Adulthood (18-29 yrs)
S20 "residential child care"
S21 "state care"
S22 "substitute care"
S23 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22
S24 abortion*
S25 DE "Induced Abortion" OR DE "Spontaneous Abortion"
S26 DE "Adolescent Mothers"
S27 adolescen* mother*
S28 adolescen* parent*
S29 DE "Adolescent Pregnancy"
S30 DE "Pregnancy"
S31 pregnan*
S32 DE "Reproductive Health"
S33 "sexual behavior" OR "sexual behaviour" OR "sexual health" OR "sexual risk"
S34 teen* conception
S35 teen* mother* OR teen* mum* OR teen* parent*
S36 "termination of pregnancy"
S37 S24 OR S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36
S38 S23 AND S37
S39 S38 Limiters - English
S40 S39 Limiters - Publication Year: 1990-2017

Social Care Online searched via <http://www.scie-socialcareonline.org.uk/> on 6/2/17 and search rerun on 1/1/21 (with rerun limited to 2017 onwards)

[- SubjectTerms:'"adoption"' including this term only
 - OR SubjectTerms:'"adopted children"' including this term only
 - OR AllFields:'"adoptee"'

- OR AllFields:'"aging out"'
- OR AllFields:'"ageing out"'
- OR SubjectTerms:'"care leavers"' including this term only
- OR SubjectTerms:'"foster care"' including this term only
- OR AllFields:'"foster youth"'
- OR SubjectTerms:'"kinship care"' including this term only
- OR AllFields:'"kinship care"'
- OR AllFields:'"LAYP"'
- OR AllFields:'"LACYP"'
- OR SubjectTerms:'"leaving care"' including this term only
- OR AllFields:'"local authority care"'
- OR SubjectTerms:'"looked after children"' including this term only
- OR AllFields:'"out of home care"'
- OR AllFields:'"out of home placement"'
- OR AllFields:'"public care"'
- OR SubjectTerms:'"residential child care"' including this term only
- OR AllFields:'"state care"'
- OR AllFields:'"substitute care"']

AND

[- SubjectTerms:'"abortion"' including this term only
- OR AllFields:'"abortion"'
- OR AllFields:'"adolescent mother"'
- OR AllFields:'"adolescent parent"'
- OR SubjectTerms:'"childbirth"' including this term only
- OR SubjectTerms:'"pregnancy"' including this term only
- OR AllFields:'"pregnancy"'
- OR SubjectTerms:'"sexual behaviour"' including this term only
- OR SubjectTerms:'"teenage parents"' including this term only
- OR SubjectTerms:'"teenage pregnancy"' including this term only]

AND

[- PublicationYear:'1990 2017']

Sociological Abstracts (1952 - current) searched via ProQuest on 29/1/17 and search rerun on 1/1/21 (with rerun limited to 1st January 2017 onwards)

((SU.EXACT("Abortion") OR abortion* OR SU.EXACT("Adolescent Pregnancy") OR ("adolescent mother" OR "adolescent mothers") OR ("adolescent parent" OR "adolescent parents") OR SU.EXACT("Miscarriage") OR SU.EXACT("Pregnancy") OR pregnan* OR ("sexual behavior" OR "sexual behaviour" OR "sexual health" OR "sexual risk") OR (teen* conception*) OR (teen* mother* OR teen* mum* OR teen* parent*)) AND (SU.EXACT("Adopted Children") OR ("adopted child" OR "adopted children" OR adoptee*) OR ("aging out" OR "ageing out") OR "alternative family care" OR ("care leaver" OR "care leavers") OR "children in care" OR SU.EXACT("Foster Care") OR ("foster care" OR "foster home" OR "foster placement" OR "foster placements") OR "foster youth" OR "group care" OR "kinship care" OR "leaving care" OR "local authority care" OR "looked after" OR ("out of home care" OR "out of home placement" OR "out of home placements") OR "public care" OR "residential child care" OR "state care" OR "substitute care")) AND la.exact("English")Limits applied

Web of Science (Core Collection 1990 to 2017, Data last updated: 2017-01-25) searched via Thomson Reuters on 26/1/17 and search rerun on 2/1/21 using Web of Science (Core Collection 2017 to 2021, Data last updated: 2020-12-31) with rerun limited to 2017 onwards

# 25	(#24) AND LANGUAGE: (English)
# 24	#23 AND #16
# 23	#22 OR #21 OR #20 OR #19 OR #18 OR #17
# 22	TS=("teenage mum" OR "teenage mother" OR "teenage parent")
# 21	TS=("teenage conception" OR "teenage conceptions")
# 20	TS=("sexual behavior" OR "sexual behaviour" OR "sexual health" OR "sexual risk")
# 19	TS=pregnan*
# 18	TS=("adolescent mother" OR "adolescent parent")
# 17	TS=abortion*
# 16	#15 OR #14 OR #13 OR #12 OR #11 OR #10 OR #9 OR #8 OR #7 OR #6 OR #5 OR #4 OR #3 OR #2 OR #1

# 15 TS="substitute care"
# 14 TS="state care"
# 13 TS="residential child care"
# 12 TS="public care"
# 11 TS=("out of home care" OR "out of home placement" OR "out of home placements")
# 10 TS="looked after"
# 9 TS="local authority care"
# 8 TS="kinship care"
# 7 TS="group care"
# 6 TS=("foster care" OR "foster home" OR "foster placement" OR "foster placements" OR "foster youth")
# 5 TS="children in care"
# 4 TS=("care leaver" OR "care leavers" OR "leaving care")
# 3 TS="alternative family care"
# 2 TS=("aging out" OR "ageing out")
# 1 TS=("adopted child" OR "adopted children" OR "adoptee" OR "adoptees")
Timespan=1990-2017

Appendix 4: Systematic review data extraction form for included studies

STUDY DETAILS
Reviewer:
Study ID:
Date data extracted:
Study title:
Author:
Year of publication:
Journal:
Aims of study:
Related to any other studies (i.e. group together)?
STUDY METHODS
Geographical setting:
Study design:
Prospective vs retrospective:
Follow up or study duration:
Population characteristics (including gender, age, inclusion criteria, exclusion criteria, care setting, definition of looked after/care leaver, sample size etc) for looked after group:
Comparator group(s) characteristics:
Were there differences between the looked after and non-looked after group(s) other than looked after status?
Dependant (outcome) variables measured in study in general:

TP outcome variables of interest for systematic review (including definition of TP used, differentiating teenage pregnancy vs teenage parenthood):
Source of TP outcome data:
Ethical approval:
Method of data analysis:
FINDINGS
Results: (Prevalence, proportion, 95% CI, ORs etc)
Are all important confounding factors identified and accounted for? (e.g. what potential confounders were taken into account in analysis and what was the impact of taking potential confounders into account? Were ethnicity/SES accounted for?)
GENERAL
Authors' comments:
Reviewer comments:
JBI critical appraisal checklist completed?
Study methodological quality - high or low?

CI (confidence interval); JBI (Joanna Briggs Institute); OR (odds ratio); SES (socioeconomic status); and TP (teenage pregnancy).

The form above was adapted from the Joanna Briggs Institute's data extraction form for prevalence and incidence studies (The Joanna Briggs Institute, 2014).

Appendix 5: Joanna Briggs Institute critical appraisal checklist for studies reporting prevalence data (The Joanna Briggs Institute, 2017)

JBI Critical Appraisal Checklist for Studies Reporting Prevalence Data

Reviewer____________________________________Date_____________________

Author ___________________Year_________Record Number_____________.

		Yes	No	Unclear	Not applicable
1.	Was the sample frame appropriate to address the target population?	☐	☐	☐	☐
2.	Were study participants sampled in an appropriate way?	☐	☐	☐	☐
3.	Was the sample size adequate?	☐	☐	☐	☐
4.	Were the study subjects and the setting described in detail?	☐	☐	☐	☐
5.	Was the data analysis conducted with sufficient coverage of the identified sample?	☐	☐	☐	☐
6.	Were valid methods used for the identification of the condition?	☐	☐	☐	☐
7.	Was the condition measured in a standard, reliable way for all participants?	☐	☐	☐	☐
8.	Was there appropriate statistical analysis?	☐	☐	☐	☐
9.	Was the response rate adequate, and if not, was the low response rate managed appropriately?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

1. **Was the sample frame appropriate to address the target population?**

   This question relies upon knowledge of the broader characteristics of the population of interest and the geographical area. If the study is of women with breast cancer, knowledge of at least the characteristics, demographics and medical history is needed. The term “target population” should not be taken to infer every individual from everywhere or with similar disease or exposure characteristics. Instead, give consideration to specific population characteristics in the study, including age range, gender, morbidities, medications, and other potentially influential factors. For example, a sample frame may not be appropriate to address the target population if a certain group has been used (such as those working for one organisation, or one profession) and the results then inferred to the target population (i.e. working adults). A sample frame may be appropriate when it includes almost all the members of the target population (i.e. a census, or a complete list of participants or complete registry data).

2. **Were study participants recruited in an appropriate way?**

   Studies may report random sampling from a population, and the methods section should report how sampling was performed. Random probabilistic sampling from a defined subset of the population (sample frame) should be employed in most cases, however, random probabilistic sampling is not needed when everyone in the sampling frame will be included/ analysed. For example, reporting on all the data from a good census is appropriate as a good census will identify everybody. When using cluster sampling, such as a random sample of villages within a region, the methods need to be clearly stated as the precision of the final prevalence estimate incorporates the clustering effect. Convenience samples, such as a street survey or interviewing lots of people at a public gatherings are not considered to provide a representative sample of the base population.

3. **Was the sample size adequate?**

   The larger the sample, the narrower will be the confidence interval around the prevalence estimate, making the results more precise. An adequate sample size is important to ensure good precision of the final estimate. Ideally we are looking for evidence that the authors conducted a sample size calculation to determine an adequate sample size. This will estimate how many subjects are needed to produce a reliable estimate of the measure(s) of interest. For conditions with a low prevalence, a larger sample size is needed. Also consider sample sizes for subgroup (or characteristics) analyses, and whether these are appropriate. Sometimes, the study will be large enough (as in large national surveys) whereby a sample size calculation is not required. In these cases, sample size can be considered adequate.

When there is no sample size calculation and it is not a large national survey, the reviewers may consider conducting their own sample size analysis using the following formula: (Naing et al. 2006, Daniel 1999)

$n= Z2P(1-P)$

$d2$

Where:

n= sample size

Z = Z statistic for a level of confidence

P = Expected prevalence or proportion (in proportion of one; if 20%, $P = 0.2$)

d = precision (in proportion of one; if 5%, $d=0.05$)

Ref:

Naing L, Winn T, Rusli BN. Practical issues in calculating the sample size for prevalence studies Archives of Orofacial Sciences. 2006;1:9-14.

Daniel WW. Biostatistics: A Foundation for Analysis in the Health Sciences.

Edition. 7th ed. New York: John Wiley & Sons. 1999.

4. **Were the study subjects and setting described in detail?**

   Certain diseases or conditions vary in prevalence across different geographic regions and populations (e.g. Women vs. Men, sociodemographic variables between countries). The study sample should be described in sufficient detail so that other researchers can determine if it is comparable to the population of interest to them.

5. **Was data analysis conducted with sufficient coverage of the identified sample?**

   Coverage bias can occur when not all subgroups of the identified sample respond at the same rate. For instance, you may have a very high response rate overall for your study, but the response rate for a certain subgroup (i.e. older adults) may be quite low.

6. **Were valid methods used for the identification of the condition?**

   Here we are looking for measurement or classification bias. Many health problems are not easily diagnosed or defined and some measures may not be capable of including or excluding appropriate levels or stages of the health problem. If the outcomes were assessed based on existing definitions or diagnostic criteria, then the answer to this question is likely to be yes. If the outcomes were assessed using observer reported, or self-reported scales, the risk of over- or under-reporting is increased, and objectivity is compromised. Importantly, determine if the measurement tools used were validated instruments as this has a significant impact on outcome assessment validity.

7. **Was the condition measured in a standard, reliable way for all participants?**

   Considerable judgment is required to determine the presence of some health outcomes. Having established the validity of the outcome measurement instrument (see item 6 of this scale), it is important to establish how the measurement was conducted. Were those involved in collecting data trained or educated in the use of the instrument/s? If there was more than one data collector, were they similar in terms of level of education, clinical or research experience, or level of responsibility in the piece of research being appraised? When there was more than one observer or collector, was there comparison of results from across the observers? Was the condition measured in the same way for all participants?

8. **Was there appropriate statistical analysis?**

   Importantly, the numerator and denominator should be clearly reported, and percentages should be given with confidence intervals. The methods section should be detailed enough for reviewers to identify the analytical technique used and how specific variables were measured. Additionally, it is also important to assess the appropriateness of the analytical strategy in terms of the assumptions associated with the approach as differing methods of analysis are based on differing assumptions about the data and how it will respond.

9. **Was the response rate adequate, and if not, was the low response rate managed appropriately?**

   A large number of dropouts, refusals or "not founds" amongst selected subjects may diminish a study's validity, as can a low response rates for survey studies. The authors should clearly discuss the response rate and any reasons for non-response and compare persons in the study to those not in the study, particularly with regards to their socio-demographic characteristics. If reasons for non-response appear to be unrelated to the outcome measured and the characteristics of non-responders are comparable to those who do respond in the study (addressed in question 5, coverage bias), the researchers may be able to justify a more modest response rate.

Appendix 6: Systematic review summary table of included study characteristics

SOURCE	CONTEXT	STUDY TYPE	POPULATION			
Author & year*	**Study location & time period**	**Study design**	**Participants**	**Exclusions**	**Care exposure†**	**Non-looked after comparison**
Barrett, et al., 2015	US - South Carolina Sample born 1981-1988	Retrospective cohort design using linkage of data from State agencies, comparing outcomes for a group of females with a juvenile delinquency history with a group of females without a juvenile delinquency history, matched by gender, ethnicity and age	Female adolescents, half had history of juvenile delinquency and half did not n=69,228	Not specified	History of placement in foster care (not defined further) 4.1% of total sample had been in foster care (7.0% of delinquent group & 1.1% of non-delinquent group)	No placement in foster care
Brännström, Vinnerljung and Hjern, 2016 (plus Brännström, Vinnerljung and Hjern, 2015)	Sweden Sample born 1973-1989	Retrospective cohort study using data linkage of national, longitudinal register data	All females born in Sweden 1973-1989 n=727,196	• Emigrated or immigrated before age 18 • Received disability pension at age 23 • Swedish born adoptees	History of in-home care (IHC) or out-of-home care (OHC) from birth to age 18 (n=29,325) Split by time in care and age at first placement: • *IHC:* IHC but no OHC (n=8,244);	Majority population (i.e. no registered child welfare intervention, n=697,871)

				• Given birth to first child before age 17	• *Short OHC:* <5 years total OHC, first placement before age 13 (n=5,690); • *Long OHC:* at least 5 years total OHC, first placement before age 13 (n=3,982); and • *Teen placement OHC:* first placement in OHC after 13th birthday, regardless of time in OHC (n=11,409).	
Cameron, et al., 2018[‡]	Finland Sample born 1987 and followed until age 28	Birth cohort study (The 1987 Finnish Birth Cohort) using data linkage of national registers	All females born in Finland in 1987 surviving the perinatal period n=29,041[§]	Not specified	Ever placed in OHC before 18th birthday (n=963 approximately) Includes: • In care at home • Foster care • Residential care	No history of OHC
Carpenter, et al., 2001	US - nationally representative sample Sample aged 15-44 when data collected in 1995	Cross-sectional study using data from Cycle 5 of 1995 National Survey of Family Growth (NSFG) NSFG Cycle 5 response rate 79%	Females aged 15-44 n=9,620	• In foster or kinship group and had experienced only 1 living situation • Ever lived in group home during childhood • Foreign born • Military personnel • Confined to institution (e.g. prison, psychiatric hospital)	Self-reported childhood living situation: • Ever lived in foster care (n=89) • Ever lived in kinship care (n=513) If experienced both care types, categorised as foster care as hypothesised to be "higher risk group"	Never lived in foster or kinship care (n=9,018)

Christoffersen, 2003¶	Denmark Sample born 1966	Retrospective cohort study using data linkage of national, longitudinal register data	National birth cohort of 41,362 women born in Denmark in 1966	• Emigrated • Died	History of foster or residential care Proportion in care not stated	No history of foster or residential care
Christoffersen and Hussain, 2008	Denmark Sample born 1981	Retrospective cohort study using data linkage of national, longitudinal register data	National birth cohort of 26,824 women in Denmark born in 1981	• Emigrated	History of at-home care or OHC (foster care or institutional care) Proportion in care unclear	No history of being in care
Christoffersen and Lausten, 2009¶	Denmark Sample born 1966	Retrospective cohort study using data linkage of national, longitudinal register data	National birth cohort of 41,362 women born in Denmark in 1966	• Emigrated • Died	History of at-home care or OHC (foster care or institutional care) Proportion in care not stated	No history of being in care
Courtney, et al., 2014	US - California Almost all participants aged 17 at baseline interview in 2013 (a small proportion were aged 16 or 18)	Survey of foster youth transitioning to adulthood, using self-reported interview data. Survey was undertaken to provide baseline data for the California Youth Transitions to Adulthood Study (CalYOUTH), a prospective, longitudinal study	Females aged 16.75-17.75 years at time of sampling who had been in California foster care system under supervision of county child welfare agencies for at least six months n=426	• Physically or mentally unable to participate • Runaway status for at least two months • Incarcerated • Returned home for at least two months • Relocated out of state • Probation wards	In foster care for at least 6 months at time of sampling (i.e. aged 16/17) Care settings included: • Non-relative family foster homes • Kinship foster homes • Treatment foster care • Group care (group homes and residential treatment facilities) • Shelters	Nationally representative females from National Longitudinal Study of Adolescent Health (‘Add Health’ study) n=not stated Add Health data was from 1995 so very dated compared with 2013 CalYOUTH data

		of foster youth outcomes. Response rate: not stated for females (95% for males & females combined)				
Craine, et al., 2014	Wales April 2012-June 2013	National audit of under 18 year olds presenting as pregnant to health services in Wales. Audit included both retrospective and prospective data collection by clinicians. Response rate 43%	14-17 year olds presenting as pregnant to health services in Wales n=812 Split by LAC status and compared with national population statistics	Not specified	Currently looked after children (LAC) As recorded by clinician answering audit question "*Is looked after children team involved now?*" Looked after history not specified further National statistics used for LAC denominator (n=800)	Non-LAC in general population in Wales National statistics used for non-LAC denominator (n=72,980)

Doyle, 2007	US - Illinois Sample aged 15 or over in 2001	Data linkage study using data from State agencies and medical service payment records, comparing outcomes for children on the margin of placement based on the different removal tendencies of child protection investigators	Females referred to Child Welfare Services (CWS): • With a first investigation of parental abuse or neglect 1990-2001; • Receiving Medicaid prior to investigation; • Aged 5-15 at time of investigation; and • Aged at least 15 at end of sample period. n=20,091	• Sexual abuse cases • Drug exposure cases • Aged 16 or older at time of investigation	Investigated by CWS and then placed in foster care (n=not stated) Foster care placement not defined further	Investigated by CWS but not placed in foster care i.e. remained at home (n=not stated)
Dworsky and Courtney, 2010 (plus Courtney, Terao and Bost, 2004; Courtney, et al., 2005; and Courtney and Dworsky, 2006)	US - Illinois, Iowa & Wisconsin Aged 17/18 at Wave 1 in 2002/2003 Aged 19 approximately at Wave 2 in 2004	Longitudinal study of foster youth transitioning from care, using self-reported interview data from first two waves of the Midwest Evaluation of the Adult Functioning of Former Foster Youth Wave 1 response rate: not stated for females (95% for	Females in OHC at age 17 who had been in state care for at least 1 year prior to their 17th birthday Wave 1: n=374 Wave 2: n=316	Unable to participate in interview due to: • Developmental disability • Incarceration • Psychiatric hospitalisation • Severe mental illness • Inability to participate in interview in English	In OHC at age 17, including: • Foster home with/without relatives • Group care • Residential treatment centres • Independent living arrangements	Nationally representative females from National Longitudinal Study of Adolescent Health (‘Add Health’ study): • At age 17/18: n=794 • At age 19: n=288

		males & females combined)		• Runaway or missing person status • Placement out of state		
Ericsson, 2012	Sweden Sample born 1987-1994	Retrospective cohort study using data linkage of national, longitudinal register data	All female registered citizens in Sweden between ages 14-19 during 2006-2008 n=487,115	Not specified	Child welfare clients (n=17,679): • OHC (foster home with kinship or non-kinship care); • Residential care; and • In-home-care. Split further by age of entry into care: • Before age 12 (n=6,904); and • After age 12 (n=10,775)	• Total population (n=487,115) • Majority population (defined as not subjected to societal care or adoption, n=not stated)
Font, Cancian and Berger, 2019	US - Wisconsin Sample born 1991-1996	Retrospective cohort study using statewide linked administrative data system	Female youth in Wisconsin aged 7-13 in 2004, split by: • Entered foster care (n=4,040) • Experienced CPS-involvement but not placed in care (n=18,869) • Low income but no CPS-involvement and not placed in care (n=48,915)	• Died • Left the State • If data missing on early-life experiences (i.e. income & program participation of birth family)	Entered foster care on/after July 2004 (aged 7-13) and before 18th birthday including: • Nonrelative family foster care • Kinship care • Congregate care or detention (group home or institution) • In a shelter • AWOL (runaways) and other (e.g. hospital)	• Investigated by CPS on/after July 2004 but not placed in care • Low-income youth (SNAP recipients) but no CPS-involvement & not placed in care
Gardner, et al., 2016	US - Wyoming Sample aged 15-18 during study period	Retrospective cohort study using statewide health care data from a	Females in Wyoming aged 15-18 split by care and health insurance status:	Not specified	Continuously in foster care age 15-18 Foster care placement not defined further	Not in foster care and continuously enrolled in respective health plan age 15-18

	2003-2014 (details unclear)	research reference database	- In foster care and receiving Medicaid, n=743 - On Medicaid but not in foster care, n=2636 - Covered by private insurance but not in foster care, n=1947			
Hobcraft, 1998	Britain - across England, Scotland & Wales Sample born 1958 and followed until age 33	Birth cohort study using longitudinal survey data from the 1958 National Child Development Study Response rate for females not stated Response rate males & females combined - 1958: 98% - Age 33: 61%	Females born in first week of March 1958 n=5,632	Not specified	Ever experienced care or fostering (based on professional and self-reported data collected at ages 7, 11 and 16) 1.9% of total sample had experienced care/fostering	Living in another family type (i.e. not in care/fostering) e.g. living with natural, adoptive or step-parents
James, et al., 2009	US - nationally representative sample Sample aged 11-14 years at baseline in 1999/2000 and	Prospective cohort study using longitudinal data from interviews from first four waves of the National Survey on Child and	Female youth with an investigation of abuse or neglect opened by the child welfare system Oct 1999-Dec 2000 n=500	Not specified	Experienced OHC during course of study including: - Relative or non-relative foster care - Treatment foster care - Group homes - Residential treatment - Inpatient psychiatric care	CWS-involved but remained at home (i.e. not placed in OHC)

	followed for 3 years until aged 14-17	Adolescent Wellbeing (NSCAW) Response rate: not stated for females (74% for males & females combined)			Proportion in care not stated	
King, et al., 2014 (plus Putnam-Hornstein, et al., 2013[#])	US - California Sample aged 15-17 between 2006-2010	Cross-sectional study using linkage of data from State agencies	All females aged 15-17 in California's foster care system between 2006-2010 n=62,402 person years in total 2006-2010 (ranging from 13,777 in 2006 to 10,737 in 2010)	Not specified	In foster care (aged 15-17) including: • Kin/relative home • Non-relative home • Congregate care • Guardianship/other	General population California n=over 4 million person years in total 2006-2010
King, 2017	US - California Sample born 1989-1993 and followed until age 20 (or end of study period in 2010 if sooner)	Prospective cohort study using longitudinal population-based, linked administrative data from State agencies	CWS-involved girls with substantiated allegation of maltreatment after their 10th birthday n=85,766	Not specified	Placed in foster care age 10 onwards (n=23,267) Foster care defined as any entry into foster care lasting at least 8 days occurring between age 10 and date of conception (if gave birth) or end of study period Foster care placement not defined further	CWS-involved but remained at home (i.e. not placed in foster care or placed in foster care for less than 8 days, n=62,499)
Lee, 2009	US - Midwestern metropolitan area	Retrospective cohort study using administrative data	CWS-involved females with a history of child abuse and neglect	Excluded from foster care group if stayed in foster care	Exited from at least one episode of foster care including: • Emergency foster care • Non-relative foster care	Received FPS but did not enter foster care (n=202)

	Sample born 1982-1994 and followed until 2006		n=467	until end of study period	• Kinship foster care • Adoption foster care • Treatment foster care • Group homes • Residential treatment centres Foster care group further divided into those receiving Family Preservation Services (FPS)[**] prior to entering foster care (n=113) and those not (n=152)	
Leppälahti, et al., 2016[‡]	Finland Sample born 1987 and followed to age 18	Retrospective cohort study using data linkage of national, longitudinal register data	National birth cohort of all girls born in 1987 in Finland surviving perinatal period n=29,041	• Died • Emigrated	Foster care placement in childhood (not defined further) (n=939)	No foster care placement in childhood
Needell, et al., 2002	US - California Sample aged 18/19 in 1996	Retrospective cohort study using data linkage of administrative data	Females emancipating from foster care in California on reaching age of majority n=not stated	Not specified	Emancipated from Child Welfare or Probation supervised foster care Foster care included: • Kinship home • Foster (non-relative) home • Foster Family Agency home • Group home • Other (e.g. specialised small family home, county shelter, medical facility)	General population California n=not stated
Oman, et al., 2018	US - California, Oklahoma & Maryland	Baseline survey using self-reported questionnaire data, undertaken	Female youth aged 13-18 living in group homes n=221	Group homes: • for pregnant and parenting teens	• In group home (serving youth in child welfare and/or juvenile justice systems)	Nationally representative survey data from Youth Risk Behavior Surveillance System

	Sample aged 13-18 in 2012-2014	as part of the *POWER Through Choices* randomised controlled trial Response rate among youths in participating group homes: 98%		(maternity homes) • for youth sexual offenders • providing therapeutic services to youth with significant mental, emotional, or behavioural issues		n=not stated
Pecora, et al., 2003	US - 23 communities in 13 States Sample aged 20-51 when data collected in 1998	Survey of foster care alumni, using data from Casey National Alumni Study involving alumni interviews and case records review Interview response rate: not stated for females (73% for males & females combined) Case record availability: not stated	Female foster youth in Casey Family Program 1966-1998 n=not stated (879 for other study outcomes)	Excluded from interviews if: • In prison • In psychiatric institution • Deceased	Placed in Casey foster care for 12 months or more and discharged from foster care at least 12 months prior to the study Placements included relative and non-relative foster care Casey is a long-term family foster care programme focusing on older children who're not likely to return home or be adopted	General population of unmarried teenage women across US in 1998 n=not stated
Shaw, et al., 2010	US - Maryland	Cross-sectional analysis of mother-child relationship data	Female youth in child welfare supervised OHC in	Not specified	In OHC during the year studied	General population Maryland n=not stated

	Sample aged 15-19 during 2000-2009	from child welfare administrative data system	Maryland, 2000-2009 n=not stated			
Vinnerljung, Franzén and Danielsson, 2007	Sweden Sample born 1972-1983 and followed until age 20	Retrospective cohort study using data linkage of national, longitudinal register data	All female children born in Sweden 1972-1983, still alive and residing in Sweden at age 20 n=573,606	• Born outside Sweden	Received registered in-home or OHC before age 18 (n=22,992) Split by care type, age at first entry to care and time spent in OHC before age 18: • IHC before teens (n=3,931); • Short-term care (<2 years in OHC) before teens (n=4,684); • Intermediate care (2 to <5 years in OHC) before teens (n=1,261); • IHC during teens (n=1,960); • Short-term care (<2 years in OHC) during teens (n=5,089); • Intermediate care (2 to <5 years in OHC) during teens (n=2,185); • Long-term care (5 to <12 years in OHC) regardless of age at entry (n=2,187); and • Grown up in care (12 years or more in OHC) (n=1,695)	Majority population (i.e. those without registered experience of in-home or OHC before age 18, n=550,614)
Vinnerljung and Sallnäs, 2008	Sweden Sample aged 13-16 in 1991 and followed until age 20	Cohort study using data linkage of national register data	Females aged 13-16 entering Swedish OHC in 1991 n=348	• Emigrated after 1991 • Died	Placed in OHC during early teens (age 13-16) Split further by reason for care: • Placed in OHC for behavioural problems (n=131); and • Placed in OHC for other reasons (n=217).	Majority population peers after OHC study group excluded, n=not stated

					OHC included foster care, residential care and secure units	
Wilson, et al., 2014	US - nationwide Sample aged 11-17 at baseline in 2008 (Wave 1) and followed for 3 years (Wave 3)	Prospective cohort study using longitudinal data from interviews from the first three waves of the National Survey on Child and Adolescent Wellbeing (NSCAW) II NSCAW II response rate Wave 1: 56%. Wave 3: not stated	CWS-involved females aged 11 and older at baseline n=417	Not specified	Ever placed in OHC (n=144)	CWS-involved but no history of OHC (n=273)

CWS (Child Welfare Services); FPS (Family Preservation Services); IHC (in-home care); LAC (looked after children); OHC (out-of-home care); and SNAP (Supplemental Nutrition Assistance Program benefits, formerly Food Stamps).

*Where a study had multiple papers all papers are listed in the table with the lead paper listed first.

†The care exposure documented in the table is as described in the cited paper. Of note, placement terminology varies between countries. For example, the term foster care has a much broader meaning in the US than the UK. Where studies of "foster care" defined this further it is listed above.

‡Cameron, et al. (2018) and Leppälahti, et al. (2016) used the same national birth cohort but different care exposures/outcomes so are listed separately.

§Sample sizes for Cameron, et al. (2018) are taken from Paananen & Gissler (2012).

¶Christoffersen (2003) and Christoffersen and Lausten (2009) used the same national birth cohort but different care exposures/outcomes so are listed separately.

#King, et al. (2014) provides data for California while Putnam-Hornstein, et al. (2013) provides data for Los Angeles County. Only the wider data for California is shown above.

**FPS is a short-term intensive service to help families in crisis improve parenting and family functioning to avoid the need for foster care placement (Lee, 2009, p.3).

Appendix 7: Assessment of each study in systematic review against Joanna Briggs Institute critical appraisal checklist for studies reporting prevalence data (The Joanna Briggs Institute, 2017)

Study	Q1: Sample frame appropriate for target population?	Q2: Study participants recruited in appropriate way?	Q3: Sample size adequate?	Q4: Study subjects & setting described in detail?	Q5: Data analysis conducted with sufficient coverage of identified sample?	Q6: Valid methods used for identification of condition?*	Q7: Condition measured in standard, reliable way for all participants?	Q8: Appropriate statistical analysis?	Q9: Response rate adequate? If not, was low response rate managed appropriately?	Comments
Barrett, et al., 2015	Y	Y	Y	Y	Y	Y	Y	Y	Y	Large data-linkage study which adjusted for several potential confounding variables.
Brännström, Vinnerljung and Hjern, 2016	Y	Y	Y	Y	Y	Y	Y	Y	Y	Very large data linkage study which adjusted for several potential confounding variables. In-home-care group size was underestimated due to register limitations recording in-home care.
Cameron, et al., 2018	Y	Y	Y	Y	Y	U	Y	U	Y	Large data-linkage study. No potential confounders accounted for in analysis. Q6: Definition of teenage parenthood not stated. Q8: Unable to calculate unadjusted OR due to inconsistencies in reporting of OHC denominator.
Carpenter, et al., 2001	Y	Y	Y	Y	Y	N	Y	Y	Y	Adjusted for several potential confounding variables. Q6: Pregnancy data self-reported. Q5/9: Response rate 79% but little difference in response by race, ethnicity and income.
Christoffersen, 2003	Y	Y	Y	Y	Y	Y	Y	Y	Y	Large data-linkage study which adjusted for several potential confounding variables.

Christoffersen and Hussain, 2008	Y	Y	Y	Y	Y	Y	Y	Y	Y	Large data-linkage study which adjusted for several potential confounding variables.
Christoffersen and Lausten, 2009	Y	Y	Y	Y	Y	Y	Y	Y	Y	Large data-linkage study which adjusted for wide range of potential confounding variables.
Courtney, et al., 2014	N	Y	U	Y	Y	N	Y	N	Y	Limited by use of dated comparison group. No potential confounders accounted for in analysis. Q1: CalYOUTH foster youth data from 2013 were compared with nationally representative AddHealth study data from 1995. However, US general population teenage pregnancy rates have fallen since the early 1990s (Kost, Maddow-Zimet and Arpaia, 2017) so the study is likely to have used too high a figure for the nationally representative comparison. Q3: Study power unclear. Q6: Pregnancy data self-reported. Q8: Comparator sample size not stated so cannot calculate OR.
Craine, et al., 2014	Y	Y	Y	Y	U	Y	U	Y	N	Limited by low response rate. Groups age matched but no potential confounders accounted for in analysis. Q5/9: Audit response rate 43%. No comparison of audit participants versus non-participants. Response bias possible (e.g. if LAC more/less likely to be included in audit than non-LAC) but presence and direction of any such bias not known. Audit asked “Is looked after children team involved now?” so potential misclassification of LAC status if LAC team involvement did not lead to child being looked after. Q7: Pregnancy data were reported by clinicians across Wales but unclear if data collection was standardised across different service providers/clinicians.
Doyle, 2007	Y	Y	U	Y	Y	Y	Y	U	Y	Used rotational assignment of child welfare investigators as quasi-randomisation of CWS-involved young people to foster care versus remained at home but not clear how effective this randomisation attempt was. Q3: Study power unclear. Q8: Limited statistical analysis for outcome of interest.
Dworsky and Courtney, 2010	Y	Y	Y	Y	Y	N	U	U	Y	Analysis adjusted for race only. Q6: Pregnancy/births data self-reported.

	🟩	🟩	🟩	🟩	🟩	🟧	🟨	🟨	🟩	Q7: Interviewer training unclear. Q5/9: Wave 1 response rate for foster youth females not stated but response bias unlikely since Wave 1 response rate for males and females combined was 95% and no significant difference observed between Wave 2 respondents and non-respondents. Q8: Numerator/denominator not available for motherhood outcome so unable to calculate OR.
Ericsson, 2012	Y	Y	Y	Y	Y	Y	Y	U	Y	Very large data-linkage study which adjusted for several potential confounding variables. Q8: Study outcomes unclear in places. For example, data points unclear in figure showing incidence of births (Ericsson, 2012, p.15).
Font, Cancian and Berger, 2019	Y	Y	Y	Y	Y	Y	U	Y	Y	Large data linkage study which adjusted for several potential confounding variables. Q7: Under-ascertainment of teen births is possible, particularly for the non-foster care groups. The data system used to identify births was estimated by the authors to capture 86-90% of all teen births in Wisconsin, but the ascertainment of births among foster youth may have been higher than the other groups due to the use of Medicaid data (which all foster youth were entitled to). If so, this would overestimate the risk of early motherhood among the foster care group, compared with the non-care experienced groups.
Gardner, et al., 2016	Y	Y	Y	N	U	U	U	Y	U	Q4: Study description unclear in places. Q5/9: Response not stated. Q6/7: Limited description of outcome data source. Consistency of outcome recording unclear.
Hobcraft, 1998	Y	Y	Y	N	U	N	U	N	U	Q4: Study description vague in places. Q5/9: Female response rate unclear. Q6: Teenage motherhood data self-reported and unclear if participants were age 23 or 33 when asked. Teenage motherhood definition not specified. Q7: Unclear whether data collection standardised. Q8: Several potential confounders adjusted for in analysis but unadjusted OR not stated. Unable to calculate unadjusted OR due to lack of numerator/denominator by care exposure.
James, et al., 2009	Y	Y	U	Y	Y	N	Y	N	Y	Q3: Study power unclear (with wide confidence interval for adjusted OR).

	🟩	🟩	🟨	🟩	🟩	🟥	🟩	🟥	🟩	Q5/9: Results weighted to adjust for non-response. Q6: Pregnancy data self-reported. Q8: Adjusted for several potential confounders but unadjusted OR not stated. Unable to calculate unadjusted OR due to lack of denominator data for proportion in/not in care.
King, et al., 2014	Y	Y	Y	Y	Y	Y	Y	Y	Y	Large data linkage study. Race/ethnicity taken into account but no other potential confounders accounted for.
King, 2017	Y	Y	Y	Y	Y	Y	U	Y	Y	Large data linkage study which adjusted for small number of potential confounding variables. Q7: The outcome measured was first birth before age 20 but births data for younger women in the cohort was only available until age 17/18. The study is therefore likely to have underestimated the risk of birth before age 20 for younger women (in both groups).
Lee, 2009	U	U	Y	N	U	Y	Y	N	U	Q1/2: Sampling unclear. Q4: Study setting unclear. Q5/9: Response rate not stated and no discussion of potential response bias. Q8: Adjusted for several potential confounders but unadjusted hazard ratio not stated.
Leppälahti, et al., 2016	Y	Y	Y	Y	Y	Y	Y	N	Y	Large data linkage study. Q8: Adjusted for wide range of potential confounders but unadjusted ORs not stated. Unable to calculate unadjusted ORs since cannot reliably determine non-looked after denominator.
Needell, et al., 2002	Y	Y	U	N	Y	Y	Y	N	Y	Limited by lack of details for outcome of interest. No potential confounders accounted for. Q3: Sample size not stated and study power unclear. Q4: Little information given about general population comparator. Q8: Statistical significance not stated and unable to calculate statistical significance or unadjusted OR due to lack of denominator data.
Oman, et al., 2018	Y	N	Y	Y	Y	N	U	N	Y	Limited by comparator. No potential confounders accounted for. Q2: Sampling of group homes was purposive and so may not represent all group homes. Q6/7: Pregnancy data self-reported. Pregnancy age range varied between groups (aged 13-18 for CEYP, under 20 for general population) so study likely to have used too high a figure for the general population comparison.

	🟩	🟧	🟩	🟩	🟩	🟧	🟨	🟧	🟩	Q8: Statistical significance not available. General population numerator/denominator not given so unable to calculate OR.
Pecora, et al., 2003	N	Y	U	N	U	U	U	N	U	Limited by comparator and by lack of detail for outcome of interest. No potential confounders accounted for. Q1: The general population comparator used birth rates from 1998 while the foster care group's teenage years covered a much wider period from 1960s onwards. Overall US teenage birth rates have declined since the late 1950s (Boonstra, 2002) so the study may have used too low a figure for the general population comparison. However, the decline in US teenage birth rates has not been smooth over time so this is not necessarily a safe assumption to make, making the likely impact less clear. Q3: Sample size unclear. Q4: Study description unclear at times. Q5/9: Female response rate not stated. No comparison of respondents versus non-respondents so unable to assess potential for response bias. Q6/7: Source/collection of foster care birth data not clearly specified. Teenage birth rate definition not specified. Q8: Birth rate estimate for foster care group vague. Statistical significance not stated and unable to calculate statistical significance or unadjusted OR due to lack of denominator data.
Shaw, et al., 2010	U	U	U	N	U	U	U	N	U	Limited by lack of details for outcome of interest. No potential confounders accounted for. Q1/2: Sampling process for OHC group unclear. Q3: Sample size not stated. Q4: Study description unclear. Q5/9: Unclear if all females in OHC were included. Q6/7: Reliability of data system used to identify children of females in OHC unclear. Q8: Statistical significance not stated and unable to calculate statistical significance or unadjusted ORs due to lack of denominator data (denominator data only available for different age range).
Vinnerljung, Franzén and Danielsson, 2007	Y	Y	Y	Y	Y	Y	Y	Y	Y	Very large data linkage study but adjusted analysis only available for males and females combined. No potential confounders accounted for in female only analysis.

Vinnerljung and Sallnäs, 2008	Y	Y	U	Y	Y	Y	Y	N	Y	No potential confounders accounted for in analysis. Q3: Study power unclear. Q8: Statistical significance not stated and unable to calculate due to lack of majority population denominator data. Unable to calculate unadjusted OR due to lack of denominator data.
Wilson, et al., 2014	Y	Y	U	Y	U	N	Y	U	U	No potential confounders accounted for in analysis. Q3: Study power unclear. Q5/9: Wave 1 weighted response rate 56%, Wave 3 response rate not stated and no comparison of respondents versus non-respondents so unable to assess potential for response bias. Q6: Pregnancy data self-reported. Q8: Unable to calculate OR due to lack of numerator data (only percentages weighted for oversampling probabilities were given).

Y=YES N=NO U=UNCLEAR

CEYP (Care Experienced Young People); CWS (Child Welfare Services); LAC (Looked After Children); OHC (out-of-home care); and OR (odds ratio).

*Outcome data from sources such as national/State registers, vital statistics, hospital records and clinicians involved in the participant's pregnancy related care were considered reliable (classed "Y"). Self-reported or data reported by social workers were considered less reliable due to potential issues with underreporting (classed "N").

Of note, the assessment above reflects the quality of the available evidence for the review questions, not the quality of the original study as a whole.

Appendix 8: NHS ethical approval letter

NHS
SCOTLAND
Research Ethics Service

East of Scotland Research Ethics Service (*EoSRES*)

TAyside medical Science Centre
Residency Block Level 3
George Pirie Way
Ninewells Hospital and Medical School
Dundee DD1 9SY

Dr Laura Hay
School of Medicine
Medical and Biological Sciences Building (Desk 7.7)
University of St Andrews
North Haugh
St Andrews
KY16 9TF

Date: 28 July 2015
Your Ref:
Our Ref: LR/**15/ES/0108**
Enquiries to: Mrs Lorraine Reilly
Direct Line: 01382 383878
Email: eosres.tayside@nhs.net

Dear Dr Hay

Study title:	**Teenage Pregnancy among Looked After Young People (LAYP) and Care Leavers in Fife: a data linkage study**
REC reference:	**15/ES/0108**
Protocol number:	**N/A**
IRAS project ID:	**141029**

The Research Ethics Committee reviewed the above application at the meeting held on 17 July 2015. Thank you for attending to discuss the application.

We plan to publish your research summary wording for the above study on the HRA website, together with your contact details. Publication will be no earlier than three months from the date of this favourable opinion letter. The expectation is that this information will be published for all studies that receive an ethical opinion but should you wish to provide a substitute contact point, wish to make a request to defer, or require further information, please contact the REC Manager Mrs Lorraine Reilly, eosres.tayside@nhs.net. Under very limited circumstances (e.g. for student research which has received an unfavourable opinion), it may be possible to grant an exemption to the publication of the study.

Ethical opinion

The members of the Committee present gave a favourable ethical opinion of the above research on the basis described in the application form, protocol and supporting documentation, subject to the conditions specified below. .

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

1

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission ("R&D approval") should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements.

Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at http://www.rdforum.nhs.uk.

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of approvals from host organisations.

Registration of Clinical Trials

All clinical trials (defined as the first four categories on the IRAS filter page) must be registered on a publically accessible database. This should be before the first participant is recruited but no later than 6 weeks after recruitment of the first participant.

There is no requirement to separately notify the REC but you should do so at the earliest opportunity e.g. when submitting an amendment. We will audit the registration details as part of the annual progress reporting process.

To ensure transparency in research, we strongly recommend that all research is registered but for non-clinical trials this is not currently mandatory.

If a sponsor wishes to request a deferral for study registration within the required timeframe, they should contact hra.studyregistration@nhs.net. The expectation is that all clinical trials will be registered, however, in exceptional circumstances non registration may be permissible with prior agreement from NRES. Guidance on where to register is provided on the HRA website.

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Ethical review of research sites

NHS Sites

The favourable opinion applies to all NHS sites taking part in the study taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Summary of discussion at the meeting

Other general comments

The Committee asked if a data transfer agreement with Fife council was required in order to obtain the data.

You confirmed you have an honorary contract with NHS Fife which includes an agreement which allows you to work with the data. You went on to say that a data transfer agreement for the data linkage was required by Fife council.

The Committee asked why you were obtaining data linkage through Information Services Division (ISD) and not through the Health Informatics Centre (HIC) in Dundee.

You said you had thought about using HIC to obtain data, but decided to use ISD as their security was more advanced.

Approved documents

The documents reviewed and approved at the meeting were:

Document	Version	Date
Evidence of Sponsor insurance or indemnity (non NHS Sponsors only) [Non NHS Insurance certificates collated 040615]	040615	04 June 2015
IRAS Checklist XML [Checklist_19062015]		19 June 2015
Letter from sponsor [Sponsorship letter LAYP Data Linkage Study 100914]	100914	10 September 2014
Other [CV Peter Donnelly 231214]	1.0	23 December 2014
REC Application Form [REC_Form_19062015]		19 June 2015
Research protocol or project proposal [Study protocol v1.0 280415]	1.0	28 April 2015
Summary CV for Chief Investigator (CI) [CV Laura Hay 231214]	1.0	23 December 2014
Summary CV for supervisor (student research) [CV Damien Williams 290914]	1.0	29 September 2014

Membership of the Committee

The members of the Ethics Committee who were present at the meeting are listed on the attached sheet.

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Reporting requirements

The attached document “After ethical review – guidance for researchers” gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

The HRA website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

User Feedback

The Health Research Authority is continually striving to provide a high quality service to all applicants and sponsors. You are invited to give your view of the service you have received and the application procedure. If you wish to make your views known please use the feedback form available on the HRA website: http://www.hra.nhs.uk/about-the-hra/governance/quality-assurance/

HRA Training

We are pleased to welcome researchers and R&D staff at our training days – see details at http://www.hra.nhs.uk/hra-training/

15/ES/0108	**Please quote this number on all correspondence**

Yours sincerely

pp
Dr Carol Macmillan
Chair

E-mail: eosres.tayside@nhs.net

Enclosures:	List of names and professions of members who were present at the meeting and those who submitted written comments “After ethical review – guidance for researchers”
Copy to:	Dr David Stevenson

East of Scotland Research Ethics Service REC 1

Attendance at Committee meeting on 17 July 2015

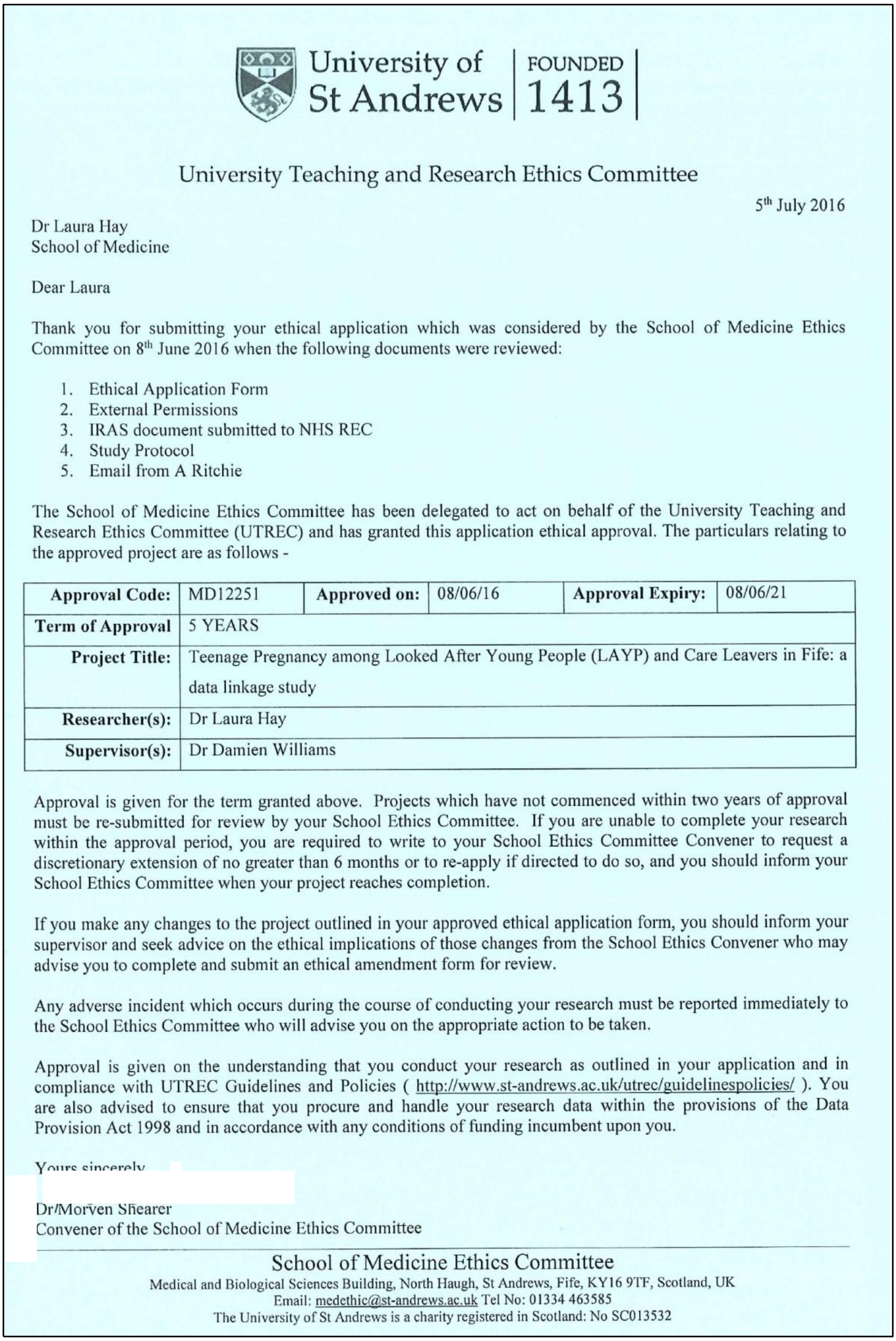
Committee Members:

Name	Profession	Present	Notes
Dr Carol Macmillan	Consultant Anaesthetist	Yes	Chair
Mr Carlos Wigderowitz	Senior Clinical Lecturer	Yes	Alternate Vice-chair
Mrs Shona Carson	Clinical Trials Pharmacist	Yes	
Dr Graham Cormack	Consultant Ophthalmologist	Yes	
Dr Gary Lyon	Retired	Yes	
Mr John Macleod	Retired	Yes	
Mr David McFarlane	Specialist Workforce Advisor	No	
Dr Robert Rea	Business Development Manager	Yes	
Dr Astrid Schloerscheidt	Lecturer	Yes	
Mrs Anne Simpson	Retired Community Nurse	No	
Dr Wendy Stevenson		Yes	

Also in attendance:

Name	Position (or reason for attending)
Mrs Caroline Ackland	Scientific Officer/Regional Manager
Mrs Lorraine Reilly	Senior Co-ordinator
Dr Anna Barnett	Observer
Miss Laura Stephen	Observer

Appendix 9: University of St Andrews ethical approval letters



University of St Andrews | FOUNDED 1413

University Teaching and Research Ethics Committee

5th July 2016

Dr Laura Hay
School of Medicine

Dear Laura

Thank you for submitting your ethical application which was considered by the School of Medicine Ethics Committee on 8th June 2016 when the following documents were reviewed:

1. Ethical Application Form
2. External Permissions
3. IRAS document submitted to NHS REC
4. Study Protocol
5. Email from A Ritchie

The School of Medicine Ethics Committee has been delegated to act on behalf of the University Teaching and Research Ethics Committee (UTREC) and has granted this application ethical approval. The particulars relating to the approved project are as follows -

Approval Code:	MD12251	**Approved on:**	08/06/16	**Approval Expiry:**	08/06/21
Term of Approval	5 YEARS				
Project Title:	Teenage Pregnancy among Looked After Young People (LAYP) and Care Leavers in Fife: a data linkage study				
Researcher(s):	Dr Laura Hay				
Supervisor(s):	Dr Damien Williams				

Approval is given for the term granted above. Projects which have not commenced within two years of approval must be re-submitted for review by your School Ethics Committee. If you are unable to complete your research within the approval period, you are required to write to your School Ethics Committee Convener to request a discretionary extension of no greater than 6 months or to re-apply if directed to do so, and you should inform your School Ethics Committee when your project reaches completion.

If you make any changes to the project outlined in your approved ethical application form, you should inform your supervisor and seek advice on the ethical implications of those changes from the School Ethics Convener who may advise you to complete and submit an ethical amendment form for review.

Any adverse incident which occurs during the course of conducting your research must be reported immediately to the School Ethics Committee who will advise you on the appropriate action to be taken.

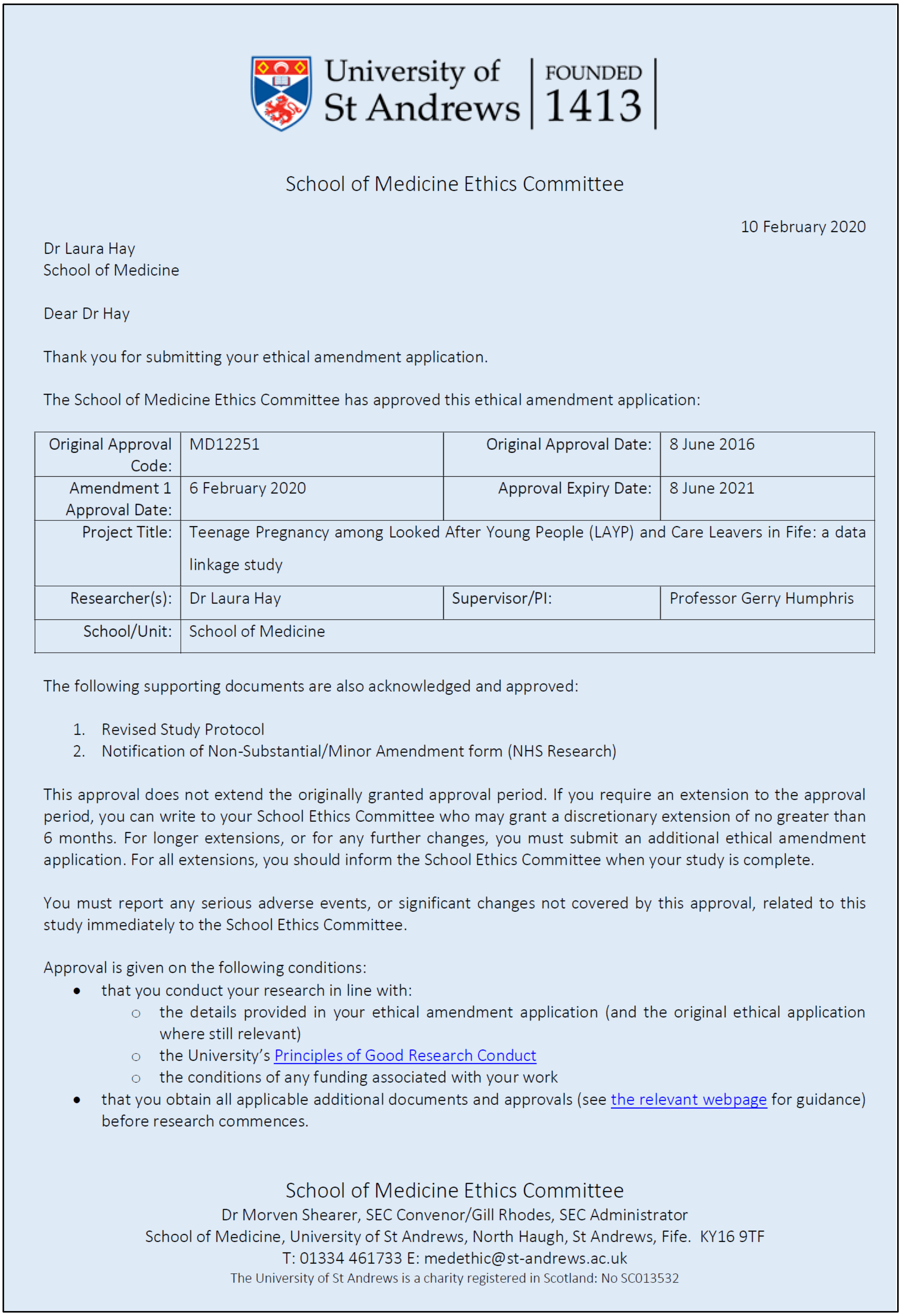
Approval is given on the understanding that you conduct your research as outlined in your application and in compliance with UTREC Guidelines and Policies (http://www.st-andrews.ac.uk/utrec/guidelinespolicies/). You are also advised to ensure that you procure and handle your research data within the provisions of the Data Provision Act 1998 and in accordance with any conditions of funding incumbent upon you.

Yours sincerely

[redacted]

Dr Morven Shearer
Convener of the School of Medicine Ethics Committee

School of Medicine Ethics Committee
Medical and Biological Sciences Building, North Haugh, St Andrews, Fife, KY16 9TF, Scotland, UK
Email: medethic@st-andrews.ac.uk Tel No: 01334 463585
The University of St Andrews is a charity registered in Scotland: No SC013532



University of St Andrews | FOUNDED 1413

School of Medicine Ethics Committee

10 February 2020

Dr Laura Hay
School of Medicine

Dear Dr Hay

Thank you for submitting your ethical amendment application.

The School of Medicine Ethics Committee has approved this ethical amendment application:

Original Approval Code:	MD12251	Original Approval Date:	8 June 2016
Amendment 1 Approval Date:	6 February 2020	Approval Expiry Date:	8 June 2021
Project Title:	Teenage Pregnancy among Looked After Young People (LAYP) and Care Leavers in Fife: a data linkage study		
Researcher(s):	Dr Laura Hay	Supervisor/PI:	Professor Gerry Humphris
School/Unit:	School of Medicine		

The following supporting documents are also acknowledged and approved:

1. Revised Study Protocol
2. Notification of Non-Substantial/Minor Amendment form (NHS Research)

This approval does not extend the originally granted approval period. If you require an extension to the approval period, you can write to your School Ethics Committee who may grant a discretionary extension of no greater than 6 months. For longer extensions, or for any further changes, you must submit an additional ethical amendment application. For all extensions, you should inform the School Ethics Committee when your study is complete.

You must report any serious adverse events, or significant changes not covered by this approval, related to this study immediately to the School Ethics Committee.

Approval is given on the following conditions:

- that you conduct your research in line with:
  - the details provided in your ethical amendment application (and the original ethical application where still relevant)
  - the University's Principles of Good Research Conduct
  - the conditions of any funding associated with your work
- that you obtain all applicable additional documents and approvals (see the relevant webpage for guidance) before research commences.

School of Medicine Ethics Committee
Dr Morven Shearer, SEC Convenor/Gill Rhodes, SEC Administrator
School of Medicine, University of St Andrews, North Haugh, St Andrews, Fife. KY16 9TF
T: 01334 461733 E: medethic@st-andrews.ac.uk
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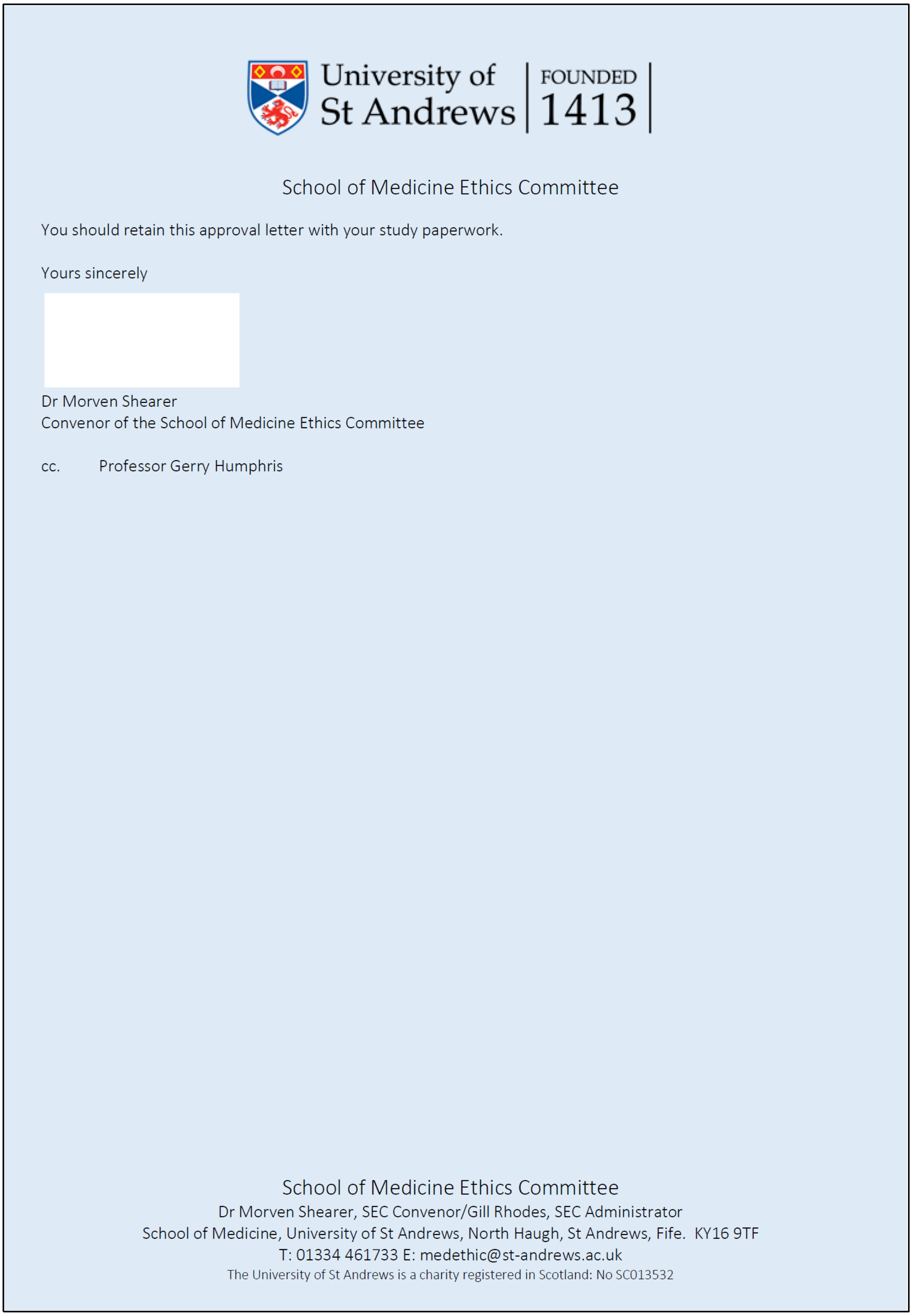

University of
St Andrews
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School of Medicine Ethics Committee

You should retain this approval letter with your study paperwork.

Yours sincerely

[redacted]

Dr Morven Shearer
Convenor of the School of Medicine Ethics Committee

cc. Professor Gerry Humphris

School of Medicine Ethics Committee
Dr Morven Shearer, SEC Convenor/Gill Rhodes, SEC Administrator
School of Medicine, University of St Andrews, North Haugh, St Andrews, Fife. KY16 9TF
T: 01334 461733 E: medethic@st-andrews.ac.uk
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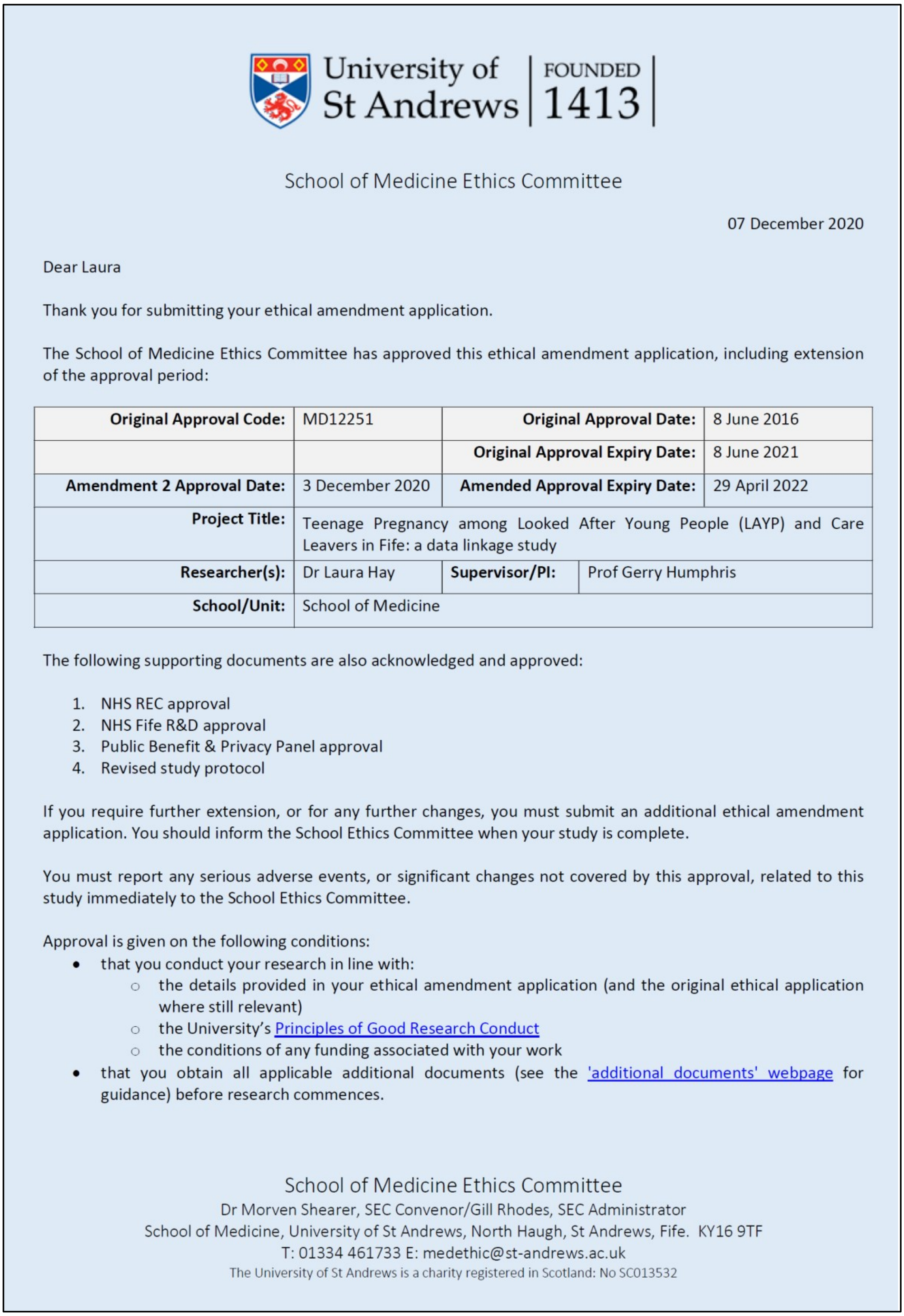

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School of Medicine Ethics Committee

07 December 2020

Dear Laura

Thank you for submitting your ethical amendment application.

The School of Medicine Ethics Committee has approved this ethical amendment application, including extension of the approval period:

Original Approval Code:	MD12251	**Original Approval Date:**	8 June 2016
		Original Approval Expiry Date:	8 June 2021
Amendment 2 Approval Date:	3 December 2020	**Amended Approval Expiry Date:**	29 April 2022
Project Title:	Teenage Pregnancy among Looked After Young People (LAYP) and Care Leavers in Fife: a data linkage study		
Researcher(s):	Dr Laura Hay	**Supervisor/PI:**	Prof Gerry Humphris
School/Unit:	School of Medicine		

The following supporting documents are also acknowledged and approved:

1. NHS REC approval
2. NHS Fife R&D approval
3. Public Benefit & Privacy Panel approval
4. Revised study protocol

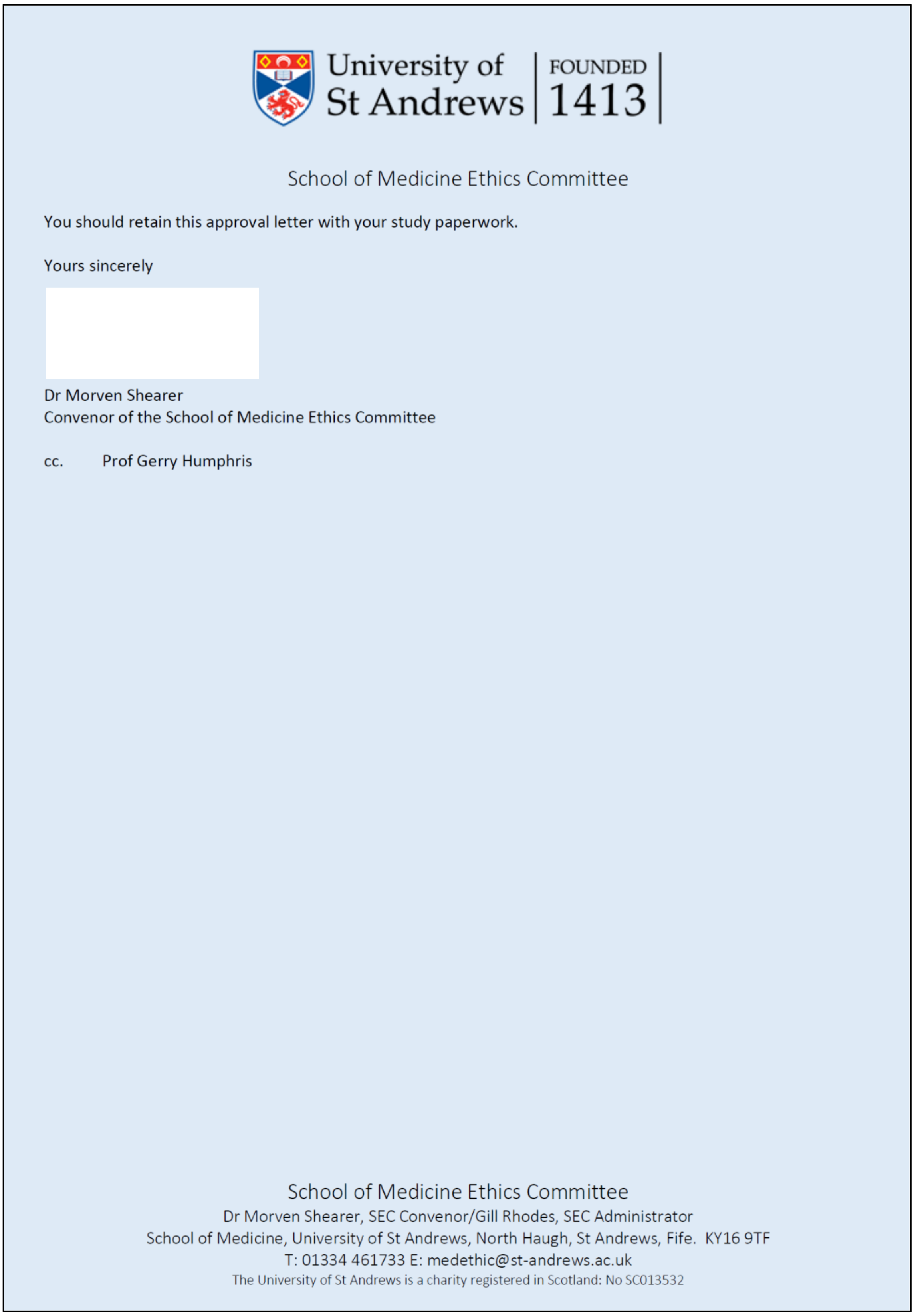
If you require further extension, or for any further changes, you must submit an additional ethical amendment application. You should inform the School Ethics Committee when your study is complete.

You must report any serious adverse events, or significant changes not covered by this approval, related to this study immediately to the School Ethics Committee.

Approval is given on the following conditions:

- that you conduct your research in line with:
  - the details provided in your ethical amendment application (and the original ethical application where still relevant)
  - the University's Principles of Good Research Conduct
  - the conditions of any funding associated with your work
- that you obtain all applicable additional documents (see the 'additional documents' webpage for guidance) before research commences.

School of Medicine Ethics Committee
Dr Morven Shearer, SEC Convenor/Gill Rhodes, SEC Administrator
School of Medicine, University of St Andrews, North Haugh, St Andrews, Fife. KY16 9TF
T: 01334 461733 E: medethic@st-andrews.ac.uk



University of St Andrews | FOUNDED 1413

School of Medicine Ethics Committee

You should retain this approval letter with your study paperwork.

Yours sincerely

[redacted]

Dr Morven Shearer
Convenor of the School of Medicine Ethics Committee

cc. Prof Gerry Humphris

School of Medicine Ethics Committee
Dr Morven Shearer, SEC Convenor/Gill Rhodes, SEC Administrator
School of Medicine, University of St Andrews, North Haugh, St Andrews, Fife. KY16 9TF
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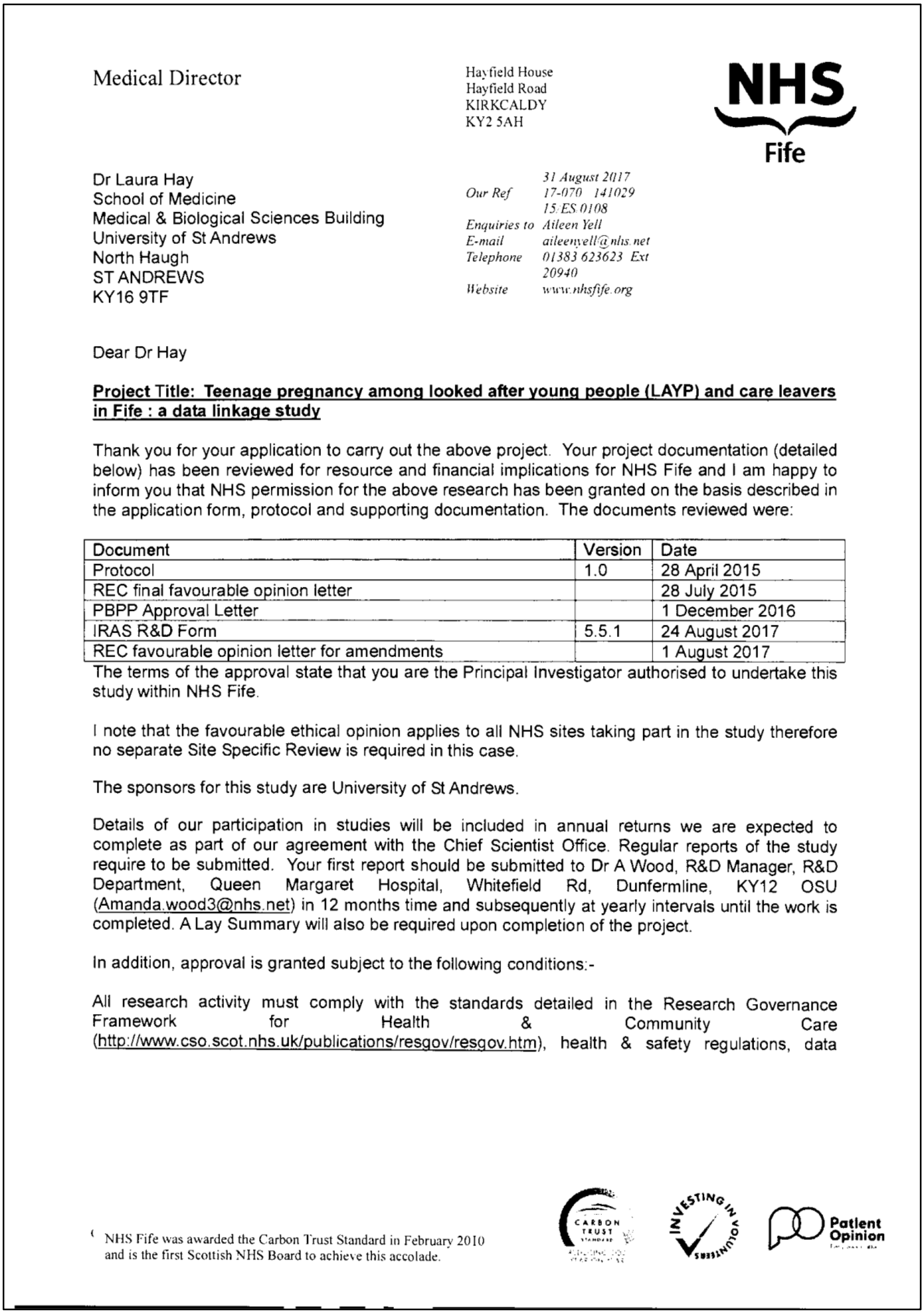
Appendix 10: NHS Fife R&D approval letter



Medical Director

Hayfield House
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KY2 5AH

NHS
Fife

Dr Laura Hay
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Medical & Biological Sciences Building
University of St Andrews
North Haugh
ST ANDREWS
KY16 9TF

31 August 2017
Our Ref *17-070 141029*
15/ES/0108
Enquiries to *Aileen Yell*
E-mail *aileenyell@nhs.net*
Telephone *01383 623623 Ext 20940*
Website *www.nhsfife.org*

Dear Dr Hay

Project Title: Teenage pregnancy among looked after young people (LAYP) and care leavers in Fife : a data linkage study

Thank you for your application to carry out the above project. Your project documentation (detailed below) has been reviewed for resource and financial implications for NHS Fife and I am happy to inform you that NHS permission for the above research has been granted on the basis described in the application form, protocol and supporting documentation. The documents reviewed were:

Document	Version	Date
Protocol	1.0	28 April 2015
REC final favourable opinion letter		28 July 2015
PBPP Approval Letter		1 December 2016
IRAS R&D Form	5.5.1	24 August 2017
REC favourable opinion letter for amendments		1 August 2017

The terms of the approval state that you are the Principal Investigator authorised to undertake this study within NHS Fife.

I note that the favourable ethical opinion applies to all NHS sites taking part in the study therefore no separate Site Specific Review is required in this case.

The sponsors for this study are University of St Andrews.

Details of our participation in studies will be included in annual returns we are expected to complete as part of our agreement with the Chief Scientist Office. Regular reports of the study require to be submitted. Your first report should be submitted to Dr A Wood, R&D Manager, R&D Department, Queen Margaret Hospital, Whitefield Rd, Dunfermline, KY12 OSU (Amanda.wood3@nhs.net) in 12 months time and subsequently at yearly intervals until the work is completed. A Lay Summary will also be required upon completion of the project.

In addition, approval is granted subject to the following conditions:-

All research activity must comply with the standards detailed in the Research Governance Framework for Health & Community Care (http://www.cso.scot.nhs.uk/publications/resgov/resgov.htm), health & safety regulations, data

NHS Fife was awarded the Carbon Trust Standard in February 2010 and is the first Scottish NHS Board to achieve this accolade.

protection principles, other appropriate statutory legislation and in accordance with Good Clinical Practice (GCP).

Any amendments which may subsequently be made to the study should also be notified to Aileen Yell, R&D Research Coordinator (aileenyell@nhs.net) , as well as the appropriate regulatory authorities. Notification should also be given of any new research team members post approval and/or any changes to the status of the project.

This organisation is required to monitor research to ensure compliance with the Research Governance Framework and other legal and regulatory requirements. This is achieved by random audit of research. You will be required to assist with and provide information in regard to monitoring and study outcomes (including providing recruitment figures to the R&D office as and when required).

As custodian of the information collated during this research project you are responsible for ensuring the security of all personal information collected in line with NHS Scotland IT Security Policies, until the destruction of this data.

Permission is only granted for the activities for which a favourable opinion has been given by the REC (and which have been authorised by the MHRA where appropriate).

The research sponsor or the Chief Investigator or local Principal Investigator at a research site may take appropriate urgent safety measures in order to protect research participants against any immediate hazard to their health or safety. The R&D office (aileenyell@nhs.net) should be notified that such measures have been taken. The notification should also include the reasons why the measures were taken and the plan for further action. The R&D office should be notified within the same time frame of notifying the REC and any other regulatory bodies.

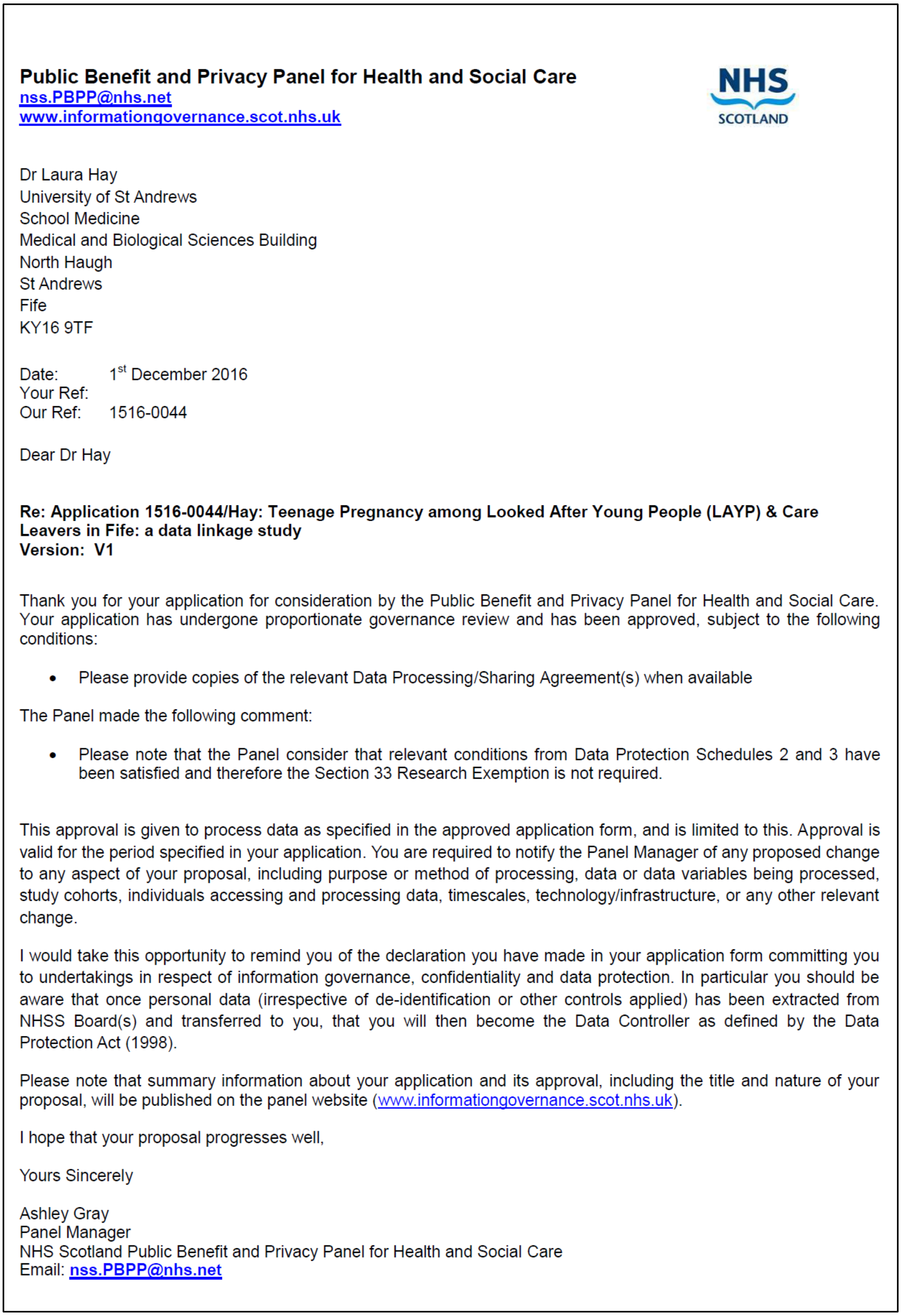
I would like to wish you every success with your study and look forward to receiving a summary of the findings for dissemination once the project is complete.

Yours sincerely

DR FRANCES ELLIOT
Medical Director
NHS Fife

Cc : Aileen Yell, R&D Research Coordinator, NHS Fife, Queen Margaret Hospital, Dunfermline

Appendix 11: PBPP approval letter



Public Benefit and Privacy Panel for Health and Social Care
nss.PBPP@nhs.net
www.informationgovernance.scot.nhs.uk

Dr Laura Hay
University of St Andrews
School Medicine
Medical and Biological Sciences Building
North Haugh
St Andrews
Fife
KY16 9TF

Date: 1st December 2016
Your Ref:
Our Ref: 1516-0044

Dear Dr Hay

Re: Application 1516-0044/Hay: Teenage Pregnancy among Looked After Young People (LAYP) & Care Leavers in Fife: a data linkage study
Version: V1

Thank you for your application for consideration by the Public Benefit and Privacy Panel for Health and Social Care. Your application has undergone proportionate governance review and has been approved, subject to the following conditions:

- Please provide copies of the relevant Data Processing/Sharing Agreement(s) when available

The Panel made the following comment:

- Please note that the Panel consider that relevant conditions from Data Protection Schedules 2 and 3 have been satisfied and therefore the Section 33 Research Exemption is not required.

This approval is given to process data as specified in the approved application form, and is limited to this. Approval is valid for the period specified in your application. You are required to notify the Panel Manager of any proposed change to any aspect of your proposal, including purpose or method of processing, data or data variables being processed, study cohorts, individuals accessing and processing data, timescales, technology/infrastructure, or any other relevant change.

I would take this opportunity to remind you of the declaration you have made in your application form committing you to undertakings in respect of information governance, confidentiality and data protection. In particular you should be aware that once personal data (irrespective of de-identification or other controls applied) has been extracted from NHSS Board(s) and transferred to you, that you will then become the Data Controller as defined by the Data Protection Act (1998).

Please note that summary information about your application and its approval, including the title and nature of your proposal, will be published on the panel website (www.informationgovernance.scot.nhs.uk).

I hope that your proposal progresses well,

Yours Sincerely

Ashley Gray
Panel Manager
NHS Scotland Public Benefit and Privacy Panel for Health and Social Care
Email: nss.PBPP@nhs.net

Appendix 12: CHI indexing process for care experienced cohort in data linkage study

This appendix summarises the probabilistic matching process for the CHI linkage for the care experienced cohort, undertaken by NRS Scotland.

Stage 1: Preprocessing

Number of Input Records:	**1,119**	
valid gender	1,119	100.0%
valid Scottish postcode (most recent, PC1)	1,117	99.8%
valid Scottish postcode (second most recent, PC2)	899	99.7%
valid Scottish postcode (third most recent, PC3)	720	100.0%
valid year of birth	1,119	100.0%
valid month of birth	1,119	100.0%
valid day of birth	1,119	100.0%
- day of birth = '01'	43	3.8%
- expected % day of birth = '01'		3.3%
filled forename (most recent)	1,119	100.0%
filled surname (most recent)	1,119	100.0%
filled forename (second most recent - Alternative)	112	10.0%
filled surname (second most recent - Alternative)	281	25.1%

Further pre-processing:

Soundex codes of NYSIIS (following ISD Scotland algorithm) of both Surname and Forename added to reformatted file.

Stage 2: BigMatch Linkage against the Indexing Spine

BigMatch is a linkage software program which implements traditional probabilistic record linkage methodology. It is designed to extract plausible matches from a large file using several blocking criteria without having to sort the file before each blocking run.

The BigMatch parameters file was set up with the following hierarchical blocking criteria:

Block number	Block description
0	Exact matches on DOB, Postcode, Full Forename and Surname
1	Matches on DOB, Full Forename and Surname
2	Matches on DOB, Full Forename and Previous Surname
3	Matches on DOB, Full Previous Forename and Surname
4	Matches on DOB, Full Previous Forename and Previous Surname
5	Matches on Full Forename and Surname, Month of Birth, Day of Birth
6	Matches on Full Forename and Surname, Year of Birth
7	Matches on Full Forename and Previous Surname, Month of Birth, Day of Birth
8	Matches on Full Forename and Previous Surname, Year of Birth

Number of pairs above threshold score output from all blocks per batch**:**

Batch Number	ExtID in batch	Number of pairs	Unique ExtID/SpineID combinations above threshold(s)	Unique ExtID above threshold(s)	Unique SpineID above threshold(s)	Unique ExtID/SpineID combinations at best match score
1	1,119	9,273	1,061	1,016	1,060	1,017
TOTAL	1,119	9,273	1,061	1,016	1,060	1,017

Stage 3: Deduplication

Identify where there are duplicate ExtID across multiple SpineID

Number of ExtID/SpineID combinations at best match score (per ExtID)	1,017
Number of ExtID matched to single SpineID at best match score	1,016
Number of unique ExtID	1,016

An automated process is carried out in order to ensure that each ExtID can appear a maximum of only once

Step 1: Where ExtID spans>1 SpineID in same block retain lowest ordered SpineID	1,017
Step 2: Where ExtID spans>1 SpineID in different blocks, drop higher numbered block(s)	1,016

Final number of external records with best matches to the Spine	1,016
Percentage of external records with best matches to the Spine	90.8%
Final number of external records with best matches to health data (CHI number)	**1,013**
Percentage of external records with best matches to health data (CHI number)	**90.5%**

Stage 4: Linkage Quality

The blocking criteria employed in this linkage and the block specific linkage thresholds were determined iteratively over a number of BigMatch runs by clerically reviewing a limited sample of best match weight pairs per blocking strategy. The final thresholds used in this linkage were set at a value of 5.0 for Blocks 0 through to 4; and a threshold of 8.0 for Blocks 5 through to 7.

After the final BigMatch run and post-run processing, best match pairs were sampled using a stratified random approach. Best match pairs were stratified by the blocking criteria and the integer part of the probabilistic linkage score. Pairs were sorted within each strata by the linkage weight, and a random sample of up to 20 pairs were selected within each block and integer weight.

In total 223 pairs were sampled across all strata. Precision estimates were calculated for each strata by dividing the number of good links by the number of pairs in the sample. The expected number of good links per strata were calculated by applying the sample precision estimates to the total number of pairs in the sample. These were then summed over all strata in order to allow precision for the cohort as a whole to be calculated.

Summary Estimate of Precision from Pairs Sampling - by Blocking Strategy:

BestBlock	Description	Frequency	Percent	Number sampled	Estimated precision
0	Exact matches on DOB, Postcode, Full Forename and Surname	664	65.4%	94	100.0%
1	Matches on DOB, Full Forename and Surname	291	28.6%	112	97.8%
2	Matches on DOB, Full Forename and Alternate Surname	15	1.5%	15	100.0%
3	Matches on DOB, Full Alternate Forename and Surname	13	1.3%	13	84.6%
4	Matches on DOB, Full Alternate Forename and Alternate Surname	-	0.0%	-	0.0%
5	Matches on Full Forename and Surname, Month of Birth and Day of Birth	6	0.6%	6	100.0%
6	Matches on Full Forename and Surname and Year of Birth	27	2.7%	27	79.6%
7	Matches on Full Forename and Alternate Surname, Month and Day of Birth	-	0.0%	-	0.0%
8	Matches on Full Forename and Alternate Surname, Year of Birth	-	0.0%	-	0.0%
Overall		1,016	100.0%	267	98.7%

Precision Estimate	**98.7%**
95% CI - Lo	98.4%
95% CI - Hi	99.0%

Appendix 13: Definition of live birth and termination of pregnancy used in data linkage study

Outcome	Source of data	Definition
Live birth		
Age at first live birth	SMR02	Age at first live birth (as defined below) recorded in SMR02, based on age at delivery.
Live birth	SMR02	Live birth recorded in SMR02, defined as "Condition on Discharge" stated as "Delivered" (Code 3) and then "Outcome of Pregnancy Baby 1" or "Outcome of Pregnancy Baby 2" or "Outcome of Pregnancy Baby 3" stated as: "Livebirth" (Code 1); "Livebirth dying within the first 6 days (early neonatal death)" (Code 3); "Livebirth dying on or after the 7th completed day but before the 28th day (late neonatal death)" (Code 4); or "Livebirth dying on or after the 28th completed day but before the end of the first year of life (postneonatal death)" (Code 5).
Live birth before age 16	SMR02	Live birth (as defined above) occurring aged 15 years 364 days or less, based on age at delivery.
Live birth before age 18	SMR02	Live birth (as defined above) occurring aged 17 years 364 days or less, based on age at delivery.
Live birth before age 20	SMR02	Live birth (as defined above) occurring aged 19 years 364 days or less, based on age at delivery.
More than one live birth before age 20	SMR02	Two or more pregnancies resulting in a live birth (as defined above) occurring aged 19 years 364 days or less, based on age at delivery. Multiple births resulting from the same pregnancy were counted as 'one live birth'.

Termination of pregnancy		
Age at first termination of pregnancy	SMR01/SMR02	Age at first termination of pregnancy (as defined below) recorded in SMR01 or SMR02, based on age at admission.
Termination of pregnancy	SMR01/SMR02	A termination of pregnancy recorded in SMR01 or SMR02. SMR01 definition: • ICD9 codes: 6350, 6351, 6352, 6353, 6354, 6355, 6356, 6357, 6358, or 6359 • ICD10 codes: O04 Medical abortion (plus its 4 digit codes) SMR02 definition: • If "Condition on Discharge" stated as "Aborted" (Code 2) and then "Type of Abortion" stated as "Therapeutic abortion" (Code 4). To avoid double counting of admissions related to the same termination: • Events occurring within 1 month of a previously coded termination event were excluded; and • Events occurring more than 1 month but less than 5 months after a previously coded termination event were excluded if the second or subsequent event was coded as an incomplete medical abortion.
Termination of pregnancy before age 16	SMR01/SMR02	Termination of pregnancy (as defined above) occurring aged 15 years 364 days or less, based on age at admission.

Termination of pregnancy before age 18	SMR01/SMR02	Termination of pregnancy (as defined above) occurring aged 17 years 364 days or less, based on age at admission.
Termination of pregnancy before age 20	SMR01/SMR02	Termination of pregnancy (as defined above) occurring aged 19 years 364 days or less, based on age at admission.
More than one termination of pregnancy before age 20	SMR01/SMR02	Two or more terminations of pregnancy (as defined above) occurring aged 19 years 364 days or less, based on age at admission.

Appendix 14: Power calculations for data linkage study

1. Background

This appendix summarises the data linkage study power calculations undertaken on 18/09/2014.

2. Desired difference to be detected in the study

Power calculations were undertaken to determine whether the study would have sufficient power to show a teenage pregnancy rate among CEYP that was 25% higher than that of their non-care experienced peers from a similar socioeconomic background.

This difference was chosen following discussion with public health colleagues on the difference in outcomes that would be considered to be of public health interest (i.e. the 'clinically significant' difference). It is recognised, however, that the decision as to what difference in outcomes is of interest is subjective and largely based on professional judgement and may vary between professionals and different contexts.

3. Test assumptions

The following assumptions were used in the power calculations:

- Significance level = 0.05 (i.e. $\alpha=0.05$); and
- Power level = 90% (i.e. $1 - \beta$, $\beta=0.1$).

The calculations used the difference between two independent proportions, two-sided test. Tests were undertaken using the *G*Power 3.1* program (Faul, et al., 2009).

4. Maximum sample sizes available

4.1 Care experienced cohort

The power calculations indicate what sample size would be required to show the desired difference in teenage pregnancy between the care experienced and non-care experienced cohorts. However, in practice the maximum sample size for the care experienced cohort in the study was limited to the number of children looked after by Fife Council between the study dates (Section 5.6.1). At the time the power calculations were undertaken, the expected size of the care experienced cohort was 838 CEYP aged 16 years and over, of whom 622 were aged 20 years and over. However, it was known that the final sample size of the care experienced cohort would also depend on the proportion of CEYP who could be successfully linked to an acceptable CHI number. The final available sample size available for various potential CHI linkage rates are shown in Appendix 14 - Table 1.

Appendix 14 - Table 1: Estimated final available sample size for the care experienced cohort for different CHI linkage rates

CHI linkage rate	Estimated sample size for care experienced cohort	
	Aged 16 and over	Aged 20 and over
100%	838	622
95%	796	591
90%	754	560
85%	712	529

Previous data linkage studies have suggested that CHI linkage rates as high as 93 to 99.9% could be achieved (Pell, et al., 2012). However, as discussed in Section 5.6.9, it was thought that the CHI linkage rate for this study would be lower. It therefore seemed prudent to assume a more conservative CHI linkage rate when planning the study's power. The power calculations therefore assumed that the study would achieve an 85% CHI linkage rate, and so would therefore have an available final sample size for the care experienced cohort of 712 CEYP aged 16 and over, of whom 529 would be aged 20 and over.

4.2 Non-care experienced but similarly deprived cohort

In contrast, the number of non-care experienced participants selected could potentially be varied. Increasing the number of non-care experienced participants would increase the power of the study but would need to be balanced against the extra resources required. The power calculations therefore considered ratios of 1:1, 1:2, 1:3 and 1:4 CEYP to non-CEYP.

5 Power calculation

5.1 Teenage pregnancy estimates used in calculation

The teenage pregnancy estimates shown in Appendix 14 - Table 2 were used in the calculation.

Appendix 14 - Table 2: Cumulative proportion of teenagers falling pregnant for the first time by 19 years, based on age at conception

	Outcome		Total
	Delivery	Termination	
Non-care experienced population with a similar deprivation profile to CEYP in Scotland*	21.9%	9.6%	31.5%
Therefore, if the proportion of CEYP experiencing the outcome was 25% higher than that of their non-care experienced peers from a similar socioeconomic background, it would be…	27.4%	12%	39.4%

*These figures were estimated by the author using data provided by ISD on first pregnancies among a national cohort of women born in 1990 (Monteath, 2014) and the SIMD profile of CEYP in Scotland from Scott, Hattie and Tannahill, 2013.

5.2 Sample size required for different ratios of CEYP to non-CEYP

The sample size required for different ratios of CEYP to non-CEYP are shown in Appendix 14 - Table 3.

Appendix 14 - Table 3: Sample size required to show a teenage pregnancy rate among CEYP 25% higher than that of their non-care experienced peers from a similar socioeconomic background

Outcome	Ratio of CEYP to non-CEYP	Sample size required*		Conclusion
		CEYP	Non-CEYP	
First pregnancy by age 19 years	1:1	769	769	1:1 insufficient
	1:2	574	1149	1:2 would only be sufficient if the CHI linkage works well (i.e. >92% linkage).
	1:3	509	1528	1:3 would be sufficient if CHI linkage rate is above 81%
	1:4	477	1906	1:4 would be sufficient if CHI linkage rate is above 76%

*Calculated using G*Power (Faul, et al., 2009).

6. Conclusion

It was concluded that the study would have sufficient power to show a teenage pregnancy rate among CEYP in Fife that was 25% higher than that of their non-care experienced peers from a similar socioeconomic background, if an 85% linkage rate to an acceptable CHI number was achieved for the care experienced cohort and a 1:3 ratio of CEYP to non-CEYP participants was used.

Appendix 15: RECORD statement for data linkage study

The RECORD statement: checklist of items, extended from the STROBE statement, that should be reported in observational studies using routinely collected health data (Benchimol, et al., 2015)

	Item No.	STROBE items	Location in manuscript where items are reported	RECORD items	Location in manuscript where items are reported
Title and abstract					
	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found	Abstract, page 19-20	RECORD 1.1: The type of data used should be specified in the title or abstract. When possible, the name of the databases used should be included. RECORD 1.2: If applicable, the geographic region and timeframe within which the study took place should be reported in the title or abstract. RECORD 1.3: If linkage between databases was conducted for the study, this should be clearly stated in the title or abstract.	Abstract, page 19-20 Abstract, page 19-20 Abstract, page 19-20
Introduction					
Background rationale	2	Explain the scientific background and rationale for the investigation being reported	Chapter 2, page 34-51		

Objectives	3	State specific objectives, including any prespecified hypotheses	Chapter 5, page 117		
Methods					
Study Design	4	Present key elements of study design early in the paper	Chapter 1, page 24-25; Chapter 5, page 118-139		
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Chapter 5, page 117-122		
Participants	6	*(a) Cohort study* - Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study* - Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study* - Give the eligibility criteria, and the sources and methods of selection of participants	Chapter 5, page 120-122, page 128-130	RECORD 6.1: The methods of study population selection (such as codes or algorithms used to identify subjects) should be listed in detail. If this is not possible, an explanation should be provided.	Chapter 5, page 118-122, page 128-130
				RECORD 6.2: Any validation studies of the codes or algorithms used to select the population should be referenced. If validation was conducted for this study and not published elsewhere, detailed methods and results should be provided.	-
		(b) Cohort study - For matched studies, give matching criteria and number of exposed and unexposed *Case-control study* - For matched studies, give matching criteria	Chapter 5, page 121, page 129-130	RECORD 6.3: If the study involved linkage of databases, consider use of a flow diagram or other graphical display to demonstrate the data linkage process, including the	Chapter 5, Figure 5.2, page 125; Chapter 5, Figure 5.3, page 132; Chapter 6, Figure 6.1, page 141

		and the number of controls per case		number of individuals with linked data at each stage.	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable.	Chapter 5, page 120-122, page 127-130, page 133-137	RECORD 7.1: A complete list of codes and algorithms used to classify exposures, outcomes, confounders, and effect modifiers should be provided. If these cannot be reported, an explanation should be provided.	Appendix 13, page 293-295
Data sources/ measurement	8	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Chapter 5, page 122-123, page 133-138		
Bias	9	Describe any efforts to address potential sources of bias	Chapter 9, page 159-160		
Study size	10	Explain how the study size was arrived at	Chapter 5, page 120-121, page 137; Appendix 13, page 296-299		
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	Chapter 5, page 138-139		
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions	Chapter 5, page 138-139; Chapter 6, page 143; Chapter 7, page 147-153; Chapter 9, page 167		

		(c) Explain how missing data were addressed (d) *Cohort study* - If applicable, explain how loss to follow-up was addressed *Case-control study* - If applicable, explain how matching of cases and controls was addressed *Cross-sectional study* - If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses			
Data access and cleaning methods		..		RECORD 12.1: Authors should describe the extent to which the investigators had access to the database population used to create the study population. RECORD 12.2: Authors should provide information on the data cleaning methods used in the study.	Chapter 5, page 121, page 130 Chapter 5, page 122
Linkage		..		RECORD 12.3: State whether the study included person-level, institutional-level, or other data linkage across two or more databases. The methods of linkage and methods of linkage quality evaluation should be provided.	Chapter 5, page 118-132; Appendix 12, page 289-292

Results					
Participants	13	(a) Report the numbers of individuals at each stage of the study (*e.g.*, numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed) (b) Give reasons for non-participation at each stage. (c) Consider use of a flow diagram	Chapter 6, page 140-142; Figure 6.1, page 141	RECORD 13.1: Describe in detail the selection of the persons included in the study (*i.e.,* study population selection) including filtering based on data quality, data availability and linkage. The selection of included persons can be described in the text and/or by means of the study flow diagram.	Chapter 6, page 140-142; Figure 6.1, page 141
Descriptive data	14	(a) Give characteristics of study participants (*e.g.*, demographic, clinical, social) and information on exposures and potential confounders (b) Indicate the number of participants with missing data for each variable of interest (c) *Cohort study* - summarise follow-up time (*e.g.*, average and total amount)	Chapter 6, page 142-145; Appendix 16, page 307		
Outcome data	15	*Cohort study* - Report numbers of outcome events or summary measures over time *Case-control study* - Report numbers in each exposure category, or summary measures of exposure *Cross-sectional study* - Report numbers of outcome events or summary measures	Chapter 7, page 146-153		

Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Chapter 7, page 146-153		
Other analyses	17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	Chapter 9, page 167, page 176-177		
Discussion					
Key results	18	Summarise key results with reference to study objectives	Chapter 7, page 146-153		
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Chapter 9, page 161-167	RECORD 19.1: Discuss the implications of using data that were not created or collected to answer the specific research question(s). Include discussion of misclassification bias, unmeasured confounding, missing data, and changing eligibility over time, as they pertain to the study being reported.	Chapter 9, page 161-167
Interpretation	20	Give a cautious overall interpretation of results considering objectives,	Chapter 9, page 172-175		

		limitations, multiplicity of analyses, results from similar studies, and other relevant evidence			
Generalisability	21	Discuss the generalisability (external validity) of the study results	Chapter 9, page 167-169		
Other Information					
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Funding, page 6		
Accessibility of protocol, raw data, and programming code		..		RECORD 22.1: Authors should provide information on how to access any supplemental information such as the study protocol, raw data, or programming code.	Research data/digital outputs access statement, page 6

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Appendix 16: Baseline socioeconomic matching characteristics for fully matched CEYP (n=889) versus fully matched non-CEYP (n=2664)

Matching variable	CEYP (n=889)		non-CEYP (n=2664)		Statistical significance of difference between groups*
	n	%	n	%	
Carstairs deprivation index quintile[†]*:*					
1 (least deprived)	40	4.5%	121	4.5%	p=1.000
2	149	16.8%	443	16.6%	
3	262	29.5%	787	29.5%	
4	321	36.1%	963	36.1%	
5 (most deprived)	117	13.2%	350	13.1%	
Social class[‡]*:*					
I (Professional)	7	0.8%	21	0.8%	p=1.000
II (Executive)	37	4.2%	111	4.2%	
III-NM (Skilled non-manual)	65	7.3%	195	7.3%	
III-M (Skilled manual)	142	16.0%	426	16.0%	
IV (Semi-skilled)	170	19.1%	509	19.1%	
V (Unskilled)	105	11.8%	315	11.8%	
NS (Inadequately described)	5	0.6%	15	0.6%	
NS (None or not stated)	321	36.1%	961	36.1%	
Other[§]	37	4.2%	111	4.2%	

CEYP (care experienced young people); non-CEYP (non-care experienced young people).

*Pearson Chi-Square, two-sided test. †Carstairs deprivation index quintile of maternal postcode at time of participants' birth. ‡Social class of parent at time of participants' birth. §Includes those born before 1980, for whom a different social class coding system was used. Further breakdown of the 'other' category is not presented due to small numbers. However, all CEYP born before 1980 were exactly matched on socioeconomic group to non-CEYP in the comparison group.

Appendix 17: The proportion of women experiencing a live birth before age 20 years, among females in the general population who were born in Fife from 1976 to 1999

Year	Number of females in general population born in Fife in that year	Number who had a live birth before age 20	Percentage	95% CI Low	95% CI High
1976	1876	245	13.1%	11.5%	14.6%
1977	1837	205	11.2%	9.7%	12.6%
1978	2011	254	12.6%	11.2%	14.1%
1979	2063	274	13.3%	11.8%	14.7%
1980	2158	268	12.4%	11.0%	13.8%
1981	2303	284	12.3%	11.0%	13.7%
1982	2143	269	12.6%	11.1%	14.0%
1983	2089	244	11.7%	10.3%	13.1%
1984	2081	248	11.9%	10.5%	13.3%
1985	2128	249	11.7%	10.3%	13.1%
1986	2181	231	10.6%	9.3%	11.9%
1987	2168	246	11.3%	10.0%	12.7%
1988	2258	266	11.8%	10.5%	13.1%
1989	2137	235	11.0%	9.7%	12.3%
1990	2159	276	12.8%	11.4%	14.2%
1991	2084	217	10.4%	9.1%	11.7%
1992	2086	262	12.6%	11.1%	14.0%
1993	2155	233	10.8%	9.5%	12.1%
1994	2087	209	10.0%	8.7%	11.3%
1995	1986	178	9.0%	7.7%	10.2%
1996	1865	125	6.7%	5.6%	7.8%
1997	1913	174	9.1%	7.8%	10.4%
1998	1891	117	6.2%	5.1%	7.3%
1999	1747	128	7.3%	6.1%	8.5%

CI (confidence interval). Source of data: From aggregate data provided by eDRIS from SMR02, with the definition of live birth before age 20 as for the study in general (Appendix 13) i.e. any live birth (one or more) before age 20 years.

Weighted general population estimate

If the general population estimates above are weighted to match the birth year profile of the 889 fully matched CEYP who were included in the fully matched analysis presented in Chapter 7, then the expected proportion of women having a live birth before age 20 that would have been observed in the general population would have been: **10.2%**

Appendix 18: The proportion of women experiencing a termination of pregnancy before age 20 years, among females in the general population who were born in Fife from 1976 to 1999

Year	Number of females in general population born in Fife in that year	Number who had a termination of pregnancy before age 20	Percentage	95% CI Low	95% CI High
1976	1876	150	8.0%	6.8%	9.2%
1977	1837	144	7.8%	6.6%	9.1%
1978	2011	130	6.5%	5.4%	7.5%
1979	2063	166	8.0%	6.9%	9.2%
1980	2158	162	7.5%	6.4%	8.6%
1981	2303	209	9.1%	7.9%	10.2%
1982	2143	185	8.6%	7.4%	9.8%
1983	2089	136	6.5%	5.5%	7.6%
1984	2081	163	7.8%	6.7%	9.0%
1985	2128	174	8.2%	7.0%	9.3%
1986	2181	172	7.9%	6.8%	9.0%
1987	2168	189	8.7%	7.5%	9.9%
1988	2258	221	9.8%	8.6%	11.0%
1989	2137	200	9.4%	8.1%	10.6%
1990	2159	207	9.6%	8.3%	10.8%
1991	2084	191	9.2%	7.9%	10.4%
1992	2086	193	9.3%	8.0%	10.5%
1993	2155	196	9.1%	7.9%	10.3%
1994	2087	185	8.9%	7.6%	10.1%
1995	1986	149	7.5%	6.3%	8.7%
1996	1865	115	6.2%	5.1%	7.3%
1997	1913	101	5.3%	4.3%	6.3%
1998	1891	77	4.1%	3.2%	5.0%
1999	1747	54	3.1%	2.3%	3.9%

CI (confidence interval). Source of data: From aggregate data provided by eDRIS from SMR01 and SMR02, with the definition of termination of pregnancy before age 20 as for the study in general (Appendix 13) i.e. any termination of pregnancy (one or more) before age 20 years.

Weighted general population estimate

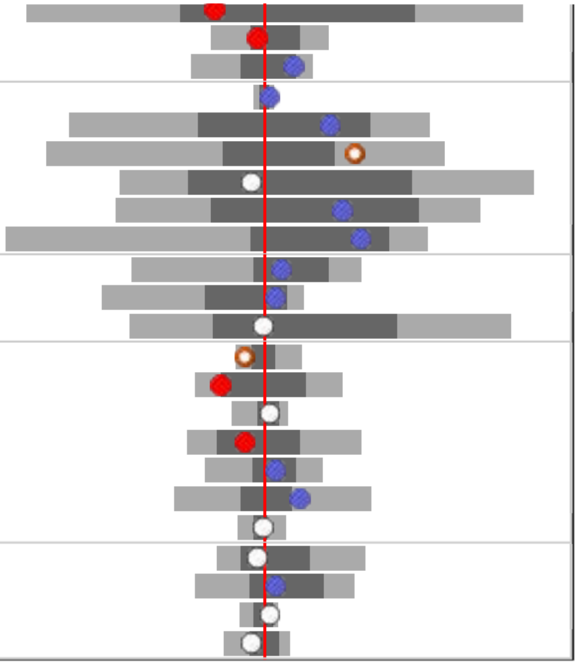
If the general population estimates above are weighted to match the birth year profile of the 889 fully matched CEYP who were included in the fully matched analysis presented in Chapter 7, then the expected proportion of women having a termination of pregnancy before age 20 that would have been observed in the general population would have been: **7.6%**

Appendix 19: Fife health and wellbeing profile indicators, compared with national average (Millard, et al., 2016)

Health & Wellbeing Profiles (Fife)

Domain		Indicator	Period	Number	Measure	Type	National Average
Life Expectancy & Mortality	1	Male life expectancy [18]	2011	n/a	77.0	yrs	76.6
	2	Female life expectancy [18]	2011	n/a	81.1	yrs	80.8
	3	Deaths all ages [12]	2013	3,746	1,128.0	sr4	1,169.8
	4	All-cause mortality among the 15-44 year olds. [12]	2013	134	103.0	sr4	100.5
	5	Early deaths from CHD (<75) [12]	2012	174	54.5	sr4	60.7
	6	Early deaths from cancer (<75) [12]	2013	546	148.4	sr4	154.7
Behaviours	7	Estimated smoking attributable deaths [3,13,16]	2014	696	347.7	sr4	366.8
	8	Smoking prevalence (adults 16+) [3,14]	2014	101	20.5	%	20.2
	9	Alcohol-related hospital stays [15]	2014	2,274	629.9	sr4	671.7
	10	Deaths from alcohol conditions [17]	2012	71	19.7	sr4	23.1
	11	Drug-related hospital stays [12,15]	2013	628	181.0	sr4	122.0
	12	Active travel to work [3,14]	2013	39	9.0	%	16.0
Ill Health & Injury	13	Patients registered with cancer [12]	2012	2,184	632.7	sr4	634.1
	14	Patients hospitalised with chronic obstructive pulmonary disease (COPD) [12,15]	2012	2,201	644.8	sr4	659.9
	15	Patients hospitalised with coronary heart disease [12]	2012	1,342	389.3	sr4	440.3
	16	Patients hospitalised with asthma [12]	2012	285	76.5	sr4	91.2
	17	Patients with emergency hospitalisations [12]	2012	24,550	6,912.9	sr4	7,500.2
	18	Patients (65+) with multiple emergency hospitalisations [12]	2012	2,876	4,496.6	sr4	5,159.5
	19	Road traffic accident casualties [12]	2012	219	60.2	sr4	63.2
Mental Health	20	Population prescribed drugs for anxiety/depression/psychosis [3]	2014	65,714	17.9	%	17.4
	21	Patients with a psychiatric hospitalisation [12]	2012	966	273.3	sr4	291.6
	22	Deaths from suicide [17]	2011	51	14.7	sr4	14.5
Social Care & Housing	23	Adults claiming incapacity benefit/severe disability allowance/ employment and support allowance	2014	17,475	4.8	%	5.1
	24	People aged 65 and over with high levels of care needs who are cared for at home [3]	2013	596	23.3	%	34.7
	25	Children looked after by local authority [3]	2013	834	10.7	cr2	14.4
	26	Single adult dwellings	2014	64,376	37.3	%	37.5
Education	27	Average tariff score of all pupils on the S4 roll [13]	2012	n/a	186.0	mean	193.0
	28	Primary school attendance	2010	24,943	94.6	%	94.8
	29	Secondary school attendance	2010	18,990	90.1	%	91.1
	30	Working age adults with low or no educational qualifications [3]	2013	21,300	9.2	%	12.6
Economy	31	Population income deprived	2014	48,560	13.2	%	13.1
	32	Working age population employment deprived	2014	28,855	12.4	%	12.2
	33	Working age population claiming Out of Work benefits	2014	28,200	12.2	%	12.0
	34	Young people not in employment, education or training (NEET). [3]	2014	1,290	7.0	%	6.5

	34	Young people not in employment, education or training (NEET). [3]	2014	1,290	7.0	%	6.5
	35	Children Living in Poverty	2012	13,525	16.4	%	15.3
	36	People claiming pension credits (aged 60+)	2014	4,975	5.3	%	6.9
Crime	**37**	Crime rate	2014	12,806	34.9	cr2	40.4
	38	Prisoner population [3,13]	2012	386	133.3	sr4	171.2
	39	Referrals to Children's Reporter for violence-related offences [3]	2013	34	1.1	cr2	2.1
	40	Domestic Abuse [3]	2014	4,200	114.4	cr9	112.0
	41	Violent crimes recorded [3]	2014	335	9.1	cr9	11.9
	42	Drug crimes recorded [3]	2014	1,547	42.1	cr9	68.9
Environment	**43**	Population within 500 metres of a derelict site	2013	94,007	25.7	%	29.7
	44	People living in 15% most 'access deprived' areas	2014	39,931	10.9	%	15.0
	45	Adults rating neighbourhood as 'a very good place to live' [3,14]	2014	n/a	56.0	%	55.8
Women's & Children's Health	**46**	Teenage pregnancies [12]	2012	559	50.0	cr2	41.1
	47	Mothers smoking during pregnancy [12]	2013	841	22.4	%	18.5
	48	Low birth weight [12]	2013	64	1.8	%	2.0
	49	Babies exclusively breastfed at 6-8 weeks [12]	2013	901	24.3	%	26.8
	50	Child dental health in primary 1	2013	2,680	68.4	%	66.7
	51	Child dental health in primary 7	2013	1,747	53.8	%	47.7
	52	Child obesity in primary 1	2013	424	10.5	%	10.1
Immunisations and Screening	**53**	Breast screening uptake [12]	2011	11,177	71.9	%	72.5
	54	Bowel screening uptake [12]	2012	33,547	56.9	%	56.0
	55	Immunisation uptake at 24 months - 5 in 1 [12]	2013	4,093	98.3	%	98.2
	56	Immunisation uptake at 24 months - MMR [12]	2013	3,944	94.7	%	95.3



Key

Notes:

3. Data available down to council (local authority) area only.
12. Three-year average number, and 3-year average annual measure.
13. Indicator based on HB boundaries prior to April 2014.
14. Two-year combined number, and 2-year average annual measure.
15. All 6 diagnosis codes used in the analysis; please see the technical report for more information.
16. Two-year average number, and 2-year average annual measure
17. Five-year average number, and 5-year average annual measure
18. Three year average for health boards, local authorities and Scotland. Five year average intermediate geographies

Spine Chart Key:

% =percent
cr2 =crude rate per 1,000 population
cr9 =crude rate per 10,000 population
mean=average
sr4 =age-sex standardised rate per 100,000 population to ESP2013. Please see Appendix I in the technical report.
yrs =years

Spine Chart Key:

🔴 Statistically significantly 'worse' than National average
○ Statistically not significantly different from National average
🔵 Statistically significantly 'better' than National average
◎ Statistically significant difference compared to National average
△ No significance can be calculated

See the detailed Definitions and Sources table for indicator information and Technical Report for further guidance on interpreting the spine.

Appendix 20: Dissemination plan for the study findings

The study’s findings will be disseminated via:

1. Summary reports to NHS Fife and the Scottish Government, as funders.
2. Presentations to stakeholders, including NHS Fife and the Scottish Government.
3. Preparation of papers for submission to peer reviewed scientific journals. Topics for potential papers include:
    a. The systematic review of the occurrence of teenage pregnancy among CEYP;
    b. The teenage pregnancy findings from the data linkage study; and
    c. The challenges faced and lessons learnt from the cross-sectoral data linkage approach used in the study.
4. Presentation at local, national and international conferences. For example, the study was presented at the International Population Data Linkage Network conference in September 2022 (Hay, Watson and Donnelly, 2022).