Understanding the information needs of perinatal women: The role of technology support tools for new mothers

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Abstract

Information seeking during the perinatal period (the period spanning pregnancy to twelve months post giving birth) comprises of several methods women use to meet information needs and gain support through pregnancy and early motherhood. Perinatal women have been shown to rely on healthcare professionals such as midwives and technology-based platforms to provide information relating to maternal and infant health. However, women have described 'gaps in care' which occur during early pregnancy (first trimester), prior to labour and the postnatal period. Postnatal mothers have a need for additional support and information after giving birth as new mothers experience less contact with healthcare professionals and access to referral services is limited in the UK. Less is known about the postnatal 'gap in care', how digital information sources tailor towards this period and how maternity services are providing postnatal care to new mothers. This thesis set out to examine further i) the changing information needs of perinatal women, ii) the role of healthcare professionals in providing information and support to new mothers, and iii) how technology sources are utilised during the perinatal period.

Three research questions were investigated through a mixed-methods approach across five studies. Qualitative findings identified a 'timeline of information needs' during pregnancy and motherhood, particularly focusing on the gaps in care experienced and the need for information often acquired through technology-based platforms. Mobile health apps for pregnancy have been shown to be beneficial for perinatal women seeking information and they increase wellbeing and encouraging self-reflection. Mobile apps specific to motherhood are seldom seen, however. A final quantitative study examined predictors of a journal-based concept app tailored towards new mothers based on an extended Technology Acceptance Model and found 'perceived usefulness' to be the most important predictor of intention to use

Findings from this thesis have provided a deeper understanding of the information work of new mothers and shown how the implementation of technology-based support tools to maternity services for new mothers has the potential to encourage self-reflection increase communication with healthcare professionals and improve the mental health and wellbeing of new mothers.

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Declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges opinions, ideas and contributions from the work of others.

Any ethical clearance for the research presented in this thesis has been approved. Approval for each study contained within the thesis has been sought and granted by the Faculty of Health and Life Sciences Ethics Committee at Northumbria University at Newcastle.

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Chapter 1: Introduction

1.1. Introduction

Understanding the information seeking behaviours of perinatal women (women who are either pregnant or twelve months post giving birth) has been a focus of previous research and the use technology to meet information needs has often been demonstrated. During pregnancy, women enjoy using mobile apps to monitor their own health in addition to foetal development across the pregnancy journey through tracking features (Johnson, 2014, Lupton, 2017). Expectant mothers find mobile apps beneficial due to quick access and the provision of information related to pregnancy symptoms, nutrition and preparation for labour and birth (Javanmardi et.al., 2018). During the early pregnancy phase (first trimester) pregnant women have highlighted a gap in care where a lack of information and contact occurs with healthcare professionals (HCPs). The often use technology platforms to ensure their information needs are met during this stage (Lupton & Pederson, 2016).

Postnatal mothers experience a further gap in care, where provision of information and support is reduced. Women often experience a greater focus on the health and wellbeing on their baby rather than on themselves during postnatal HCPs appointments (McLeish et.al., 2020) and this is referred to as the 'invisible mother' (Tyler & Baraitser, 2013). Due to the reduction in care experienced by postnatal mothers, this can lead to the utilisation of other sources of information to meet information and support needs during this stage (McLeish, et.al, 2020). During the postnatal phase, adapting to caring for an infant, recovering from birth, and less contact with HCPs than during pregnancy can lead to feelings of psychological distress (Slomian et.al, 2017) and correct provision and information and support can help to reduce this (McLeish et.al, 2020). Continuity of care is often lessened from pregnancy to postnatal and new mothers often feel that continuity of information provision in the postnatal phase is lacking (Ollander et.al., 2019). Health professionals' perspectives have raised issues such as time constraints to provide breastfeeding support (Swerts et.al., 2016) and high workload plus communication difficulties between HCPs (Van Stenus et.al., 2016) can lead to difficulties in providing continuity of care to new mothers.

Use of digital technology for motherhood has beneficial impact and mobile health apps can be useful tools for providing new mothers with information and support. Mobile apps can help to increase breastfeeding confidence by locating breastfeeding friendly public areas (Balaam et.al., 2015) assisting mothers to gain a sense of preparedness for different stages of infant development (Lupton, 2017) and improving wellbeing through peer support and online community (Lee & Moon, 2016). However, technology-based tools such as mobile apps that have a specific focus on motherhood are scarce. New mothers have highlighted desired features on mobile apps for motherhood such as information around breastfeeding challenges (Demirci et.al., 2016). Mobile apps however, are baby centric and focus on the provision of information and features to store personal generated data (PGD) such as their sleep and feeding behaviours (Lupton, 2017) and specific motherhood focused mobile apps are lacking. Digital maternity services in the UK have implemented technology-based tools including the eRedbook (digitised child health record book) in the plan to improve access to care for perinatal women (Cumberland, 2016; digital.nhs.uk). However, little is known of the views of perinatal women and HCPs in using digitised tools for maternity care and what features are desired for successful implementation of technology-based support tools during this period. This thesis aims to address this problem through several aims and research objectives. The epistemological positioning of the research conducted throughout this thesis was critical realism, which acknowledges that perinatal women view pregnancy and motherhood as real and observable and interpreting meaning of this through subjective experiences.

1.2. Research aims

The aim of this thesis was to examine how both pregnant and postnatal women (referred to as perinatal women) seek health information and support and to identify the role of technology platforms for accessing support and information in the perinatal period. A mixed-methods approach was taken in this thesis to explore three research questions across five studies:

1. How do perinatal women engage in health information work?
2. What is the role of health professionals in providing support and information to new mothers?
3. How can technology be used as a supportive tool for new mothers?

1.3. Research objectives

To answer the three research questions the specific research objectives were:

1. To identify current information needs of perinatal women and explore the changing needs across the timespan of early pregnancy to early motherhood (Study 1)
2. To discover how perinatal women are using information once sought, how this information is stored and shared in online and offline channels. (Study 1 and 2)
3. Explore how a technology based (and paper based) motherhood specific information PGD (Personal Generated Data) tool could encourage new mothers to store PGD and share this with HCPs (Study 2 and 5)
4. Gain a health professional perspective of how UK maternity services are currently providing information and support to perinatal women. (Study 3)
5. Review the currently available mobile health apps for pregnancy and motherhood to identify useful features, user perspectives of information provision, and functionality. (Study 4)

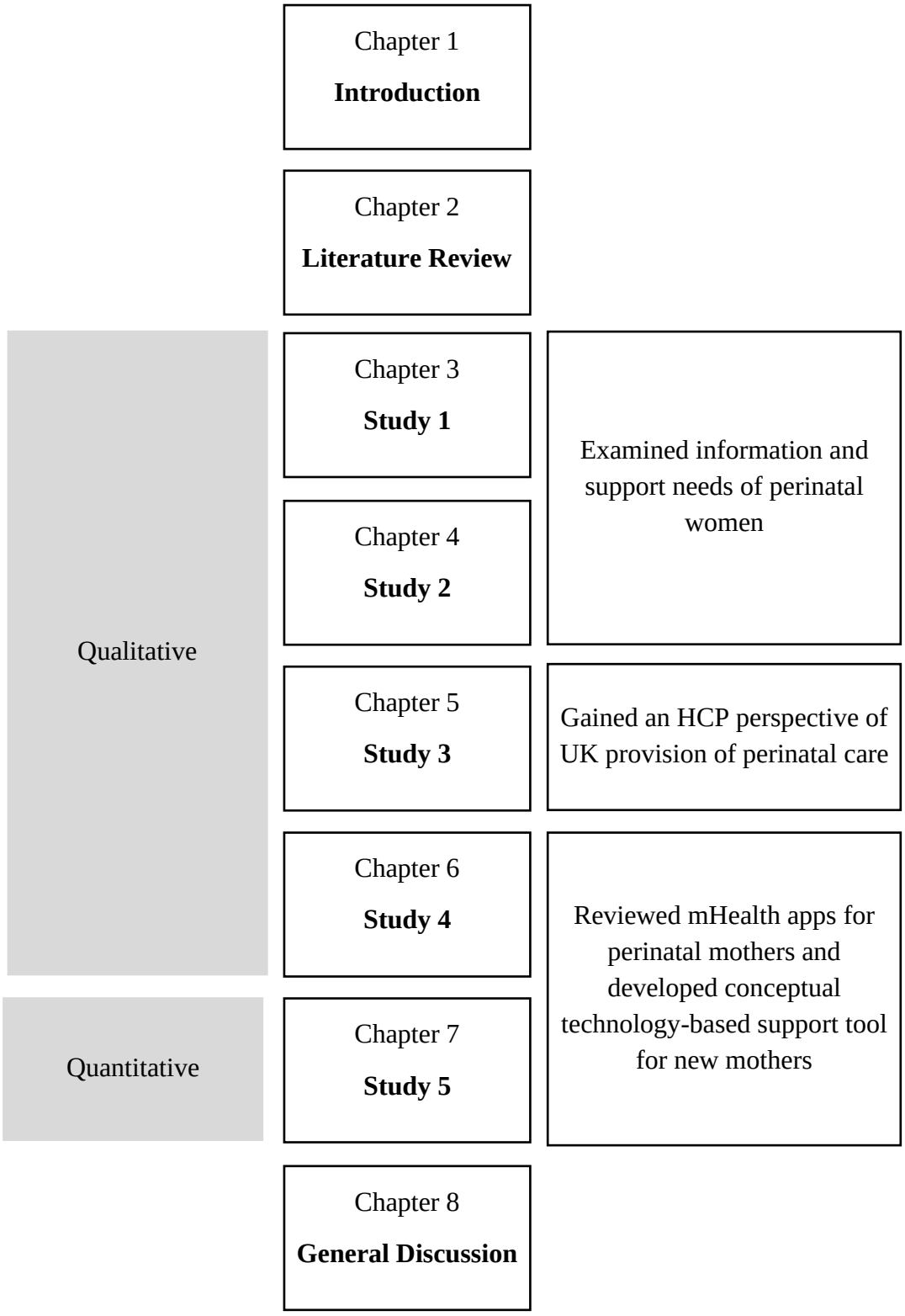


Figure 1: *Overview of chapters and thesis approach*

1.4. Overview of studies

To examine the research objectives of this thesis, a mixed methods approach was taken. Following the literature review (Chapter 2), studies 1 to 4 used qualitative methods to firstly gain a greater understanding of the information seeking behaviours of perinatal women and explore how they engage with this information through the process of storing and sharing. Having acknowledge a gap in care during the postnatal phase during study 1, the following studies took a greater focus on the postnatal stage to identify the key information needs during this phase and how access to support through health professionals and technology was sought. A health professional perspective was achieved and led to further insight to how UK maternity health professionals currently offer information and support to perinatal women. Study 5 primarily used quantitative methods to examine the predictors of a concept-based idea of a technology support tool (mobile app) for new mothers with an added qualitative element to gain greater awareness of what might encourage potential use of the app. The following sections of this chapter provide an overview of the main findings of each of the five studies examined in this thesis.

1.4.1. Study 1 (Chapter 3)

Study 1 took a qualitative approach to examine the information seeking behaviours of perinatal women and examine they engage in information work (seeking, storing and sharing the information). Previous literature had focused on specific time periods of pregnancy and postnatal to identify the information needs of perinatal women and what resources they use to gather information. This study contributed to previous findings and adopted a timeline approach to examine information behaviours of perinatal women through early pregnancy to early postnatal to identify the changing information needs across this time. Ten perinatal women took part in semi structured interviews and a thematic analysis was used to analyse the data. Four overarching themes were created to reflect specific timings across the perinatal stage which included *'Pre/Early Pregnancy'*, *'Mid Pregnancy', Late Pregnancy/Labour + Birth',* and *'Postnatal'.* Within each overarching theme several sub-themes were produced. '*Pre/'Early Pregnancy'* explored the information women require when planning for pregnancy and during the early pregnancy stage where a gap in care was identified. Technology-based tools such as mobile apps were used by pregnant women during this stage, and they particularly enjoyed the 'Baby as fruit' feature to track foetal

development. *'Mid Pregnancy'* highlighted the stage of pregnancy where information exchange occurs (sharing of information between women, other women and HCPs), how technology could be used to facilitate midwife appointments, and the use of a social community to gain experiential information. '*Late Pregnancy/Labour + Birth'* was the stage where provision of information related to preparing for labour and birth was lacking from HCPs. Therefore, pregnant women utilised other sources of information such as family and friends and technology platforms to support their information needs. *'Postnatal'* reflected on the transition of HCPs from pregnancy to postnatal and how this shift in care provision can lead to new mothers feeling vulnerable and reluctant to share personal information with HCPs. Due to lack of HCP support experienced by new mothers in the postnatal stage, technology-based platforms act as information and support tools. It was evident that new mothers experience a disparity in care from pregnancy to postnatal and that the postnatal stage was a stage of the timeline which required further examining to assess what information sources are currently being accessed by new mothers. The findings of study 1 led to the design of study 2, which aimed to gain a further sense of how information and support was provided and sought by new mothers in the early postnatal phase with a focus on mothers as well as baby centred information needs.

1.4.2. Study 2 (Chapter 4)

Study 2 used qualitative methods to further investigate postnatal mothers' experiences of information and support and assess the use of a diary style tool designed for new mothers. Study 2 took a longitudinal approach to examine the changing information needs and support offered and sought in the first six months post giving birth. Two first time postnatal mothers, who had previously participated in study 1 interviews whilst in the late stages of pregnancy, took part in a case study which comprised of monthly interviews (exception of month five) giving a total of ten interviews. Alongside semi structured interviewing, both mothers were given a 'new mum journal' to document weekly accounts of their postnatal recovery, emotional wellbeing, and experiences of caring for a newborn. The 'new mum journal' acted as a support tool for mothers to reflect on their experiences of motherhood and to provide a focus on themselves as well as baby. The journal spanned the first twelve weeks post birth and was used a prompt to encourage discussion at interviews. A template analysis was applied to the interview data and produced three overarching themes along with

subthemes. The first theme *'Postnatal Information Seeking'* captured how both mothers sought information in the postnatal stage which included use of technology such as mobile apps to extract information. Both mothers spoke of HCPs being an important information source however they both experienced a lack of support from HCPs at postnatal home visits. Often support would be sought from other mothers through online channels such as discussion forums for new mothers and social media to connect with other new mums. The second theme *'Curating and Sharing Personal Generated Data (PGD'* explored how new mothers used the 'new mum journal' to store their own personal data. Storing PGD in the journal encouraged self-reflection which had beneficial impact on the mothers who could track their mental wellbeing following birth. Mothers felt storing PGD in a journal could make personal information easier to share with HCPs and act as a prompt during postnatal home visits. The final theme *'Digital Platforms to Record and Share PGD'* focused on the idea of a digitised 'new mum journal' and the eRedbook. Mothers described the benefits of both digitised tools. This included easily accessible information and the potential of a combined tool to store mother and baby information in one platform, however this did highlight some barriers around privacy of information and how PGD might be stored and shared on a digital tool. The findings of study 2 provided an in-depth focus on the postnatal stage and how information and support is received from HCPs, how mothers seek information and how technology-based tools could assist new mothers during this phase. Findings from this study led to a need to gain a health professional perspective from maternity HCPs to gain an understanding of the current practice of postnatal care in the UK.

1.4.3. Study 3 (Chapter 5)

Study 3 took a qualitative approach to examine the health professional perspective of how information and support is currently provided to postnatal mothers in the UK. Five health professionals (three midwives and two health visitors) took part in semi structured interviews. A thematic analysis was used to analyse the data and four overarching themes each with subthemes were produced. The first theme *'The Routine Nature of Appointments'* discussed the changing nature of appointment structure from the perspective of retired HCPs to current practice. There was a noticeable change in appointment structure with fewer postnatal appointments and home visits currently being provided to new mothers. HCPs spoke of the importance of continuity of care

for building good relationships from pregnancy through to postnatal and it was particularly important for health visitors to have contact with women while pregnant prior to care commencing in the postnatal phase. Both midwives and health visitors discussed that the structure of care for each postnatal home visit was equally centred on baby and mother and mothers should receive a full physical and mental wellbeing check. The second theme *'A Two-way Exchange: Information sharing, New mothers and HCPs',* highlighted the specific time points during the perinatal period where specific information is provided to women and what information is sought by HCPs about women. Throughout pregnancy, expectant mothers are also asked to share personal health information, HCPs discussed the importance of building a relationship with women to encourage the information exchange process. The third theme *'A Focus on Mums Mental Health'* highlighted how HCPs monitor postnatal mothers' mental wellbeing following birth and include mental health assessments as part of antenatal and postnatal appointments. However, for mothers struggling with postnatal mental health, referrals to support services was limited due to lack of access and availability. The final theme '*Digital Record Keeping for Mother and Baby'* discussed the views of HCPs on the implementation of digitised tools in maternity services. Relating to the eRedbook and a digitised 'new mum journal' HCPs were encouraging of the use of technology-based tools and highlighted how they could be useful for new mothers to track their health and provide easily accessible information. The barrier of digital inclusion was raised and ensuring that technology-based tools would be accessible for low SES mothers. The findings of this chapter showed a greater understanding of the perspectives of HCPs and current maternity practice in the UK. Involving key stakeholders in this study was important to understand how maternity care is currently being provided to postnatal mothers and how the development of technology-based tools could improve this practice.

1.4.4. Study 4: (Chapter 6)

Study 4 used qualitative methodology to conduct an app review of currently available mobile apps for pregnancy and parenting. Firstly, an autoethnographic observation of apps was performed to assess the variety of functions and features of each app. Twenty mobile apps were downloaded on an android mobile device and observed for the information provided in app, access to resources, ease of use and usefulness, and gain an awareness of how other users may rate the apps. Findings from the

autoethnographic observation highlighted that information provision and tracking were most common features seen in the apps. Most apps appeared baby centred and included features tailored towards providing information on foetal development and baby sleep or feeding tracking. Secondly, a functionality review of all twenty apps was conducted to examine their content and features and how practical each feature was to use. A total of twenty features was found across the twenty apps which included for example, *'Baby Monitoring'*, *'Child Information Resources'* and '*Motherhood Community'.* Most apps required registration to access the available content and personalisation was encouraged to tailor information to the stage of gestation of age on infant. Daily articles were featured in most apps, providing snippets of information related areas such as to foetal development, weaning, and child health issues. Fewer apps contained specific information for new mothers and personalisation and tracking features to track the mother's health appeared to be lacking. The final phase of study 4 included a user review of each of the twenty apps taken from 588 user reviews of apps available in the Google Play Store. User reviews were analysed using a thematic analysis and four main themes were created to reflect the main barriers and facilitators to apps use which included 'Expert on your parenting journey'- valued information in app', 'Practical features, Baby vs Mother', 'Glitches in app- faults and fees' and 'Improved function recommendations'. User reviews highlighted that although the mobile apps contain useful information which appeared to be trusted by users, and often enjoyed the tracking features to monitor their child's health, there were barriers to use. This included functions of the apps and glitches experienced to enable access to the app along with the monetary implications of apps either cost of registration or paying for premium content to access the apps full content and features. Users provided several recommendations on how the apps could be improved to allow easier use. Findings from Study 4 demonstrated how most apps were baby centred and lacked specific focus on mothers, this led to the final study which involved examining the predictors of use of a specific motherhood focused app design.

1.4.5. Study 5 (Chapter 7)

Study 5 used quantitative methods to examine predictors of using a technology-based support tool for new mothers using the Technology Acceptance Model (TAM) (Davis, 1989). As self-reflection for new mothers was a key finding across the studies from this thesis, a technology-based support tool was designed on the concept of a digitised

'new mum journal' with additional features contained in the eRedbook. This was to examine usefulness for new mothers and to assess if this tool could improve wellbeing and communication between women and HCPs. 102 new mothers participated in a survey using an extended TAM model to assess predictors of intention to use a concept based mobile app design for new mothers. Early testing of the model revealed potential issues with the model in its original form, therefore an alternative version was presented with predictors including 'Perceived Ease of Use', 'Privacy Concerns', 'HCP Support' and 'Social Support', and the outcome was a combined variable 'intention plus' (including intention, attitudes, perceived usefulness, and trust). A regression analysis revealed 'Perceived ease of use' to be a significant predictor of intention (plus)to use the concept motherhood app and 'Privacy' to be a significant negative predictor of intention plus. A qualitative thematic analysis of survey data was applied and revealed four main themes *'How far I have come as a mother' – encouraging self-reflection', 'Mother and baby in one place' – a combined app', 'Privacy concerns over sharing personal information'* and *'Finding time' and barriers to app use'.* Self-reflection was highlighted by new mothers who suggested that the concept based mobile app could encourage mothers to reflect on their postnatal wellbeing. Many new mothers also spoke of the usefulness of having a combined mother and baby tool where they could store personal generated data related to themselves as they often felt overlooked during postnatal HCP appointments. Barriers included privacy concerns around data sharing and who would have access to the app, along with finding time to use the app. Study 5 produced useful findings and proposed a concept of technology-based support tool that could be useful to new mothers to both encourage self-reflection and improve communication with HCPS.

1.5. Original contributions of thesis

Original contributions of this thesis:

1. Identified specific time points across the perinatal period where information and support are lacking and gaps in care occur by taking a timeline approach. (Study 1)
2. Provided a deeper focus on the postnatal period and took a longitudinal approach to assessing the experiences, information, and support needs of new mothers. (Study 2)

3. Designed and implemented a paper-based support tool for postnatal mothers to encourage journaling and self-reflection. (Study 2)
4. Examined the role of UK healthcare professionals as key stakeholders in providing maternity care and gained a perspective on the implementation of technology-based support tools for new mothers. (Study 3)
5. Conducted a user and functionality review of currently available apps for pregnancy and motherhood to identify common features, and the current barriers and facilitators to mobile apps use for perinatal women. (Study 4)
6. Extended the theoretically based Technology Acceptance Model (TAM) to apply to predicting use of a technology-based support tool for postnatal mothers. (Study 5)
7. Designed a concept-based technology support tool (mobile app) based on a combined digitised mum journal and eRedbook and used the TAM model to examine predictors of potential use. (Study 5)

Chapter 2: Literature review

This chapter focuses on the existing literature examining information seeking and support during the antenatal and postnatal period and how new and expectant mothers use technology to meet information needs, share information and store personal information during pregnancy and early motherhood. The chapter is split into three main sections to provide an overview of the research problem. The first section focuses on information needs of expectant and new mothers and how these are met in the 'offline' and 'online' world using family, friends, and healthcare professionals and how women rely on support during this time. The second section outlines the role of technology as an information source and how women use digital resources to both seek, store, and share information, and what the barriers and facilitators to this are. The third section provides an overview of the role of healthcare professionals in perinatal care, how UK maternity practice provides support and care during the perinatal period and how they view technology as a source of information and communication. The current context of the NHS will be outlined and how digital development is shaping UK maternity services.

Taken together, the three sections identify a gap in the literature pertaining to how the information needs of perinatal women change along the pregnant to postnatal journey, which time points mothers require most information and which resources are most useful for the successful meeting of new mothers' information needs. Secondly, a gap around the views of UK healthcare professionals in how maternity services are supporting and caring for perinatal women and how the role of technology and provision of digital information sources for storing and extracting perinatal women's personal information can be used to facilitate and improve communication and relationships between women and maternity healthcare professionals.

2.1. Information needs for perinatal women

The perinatal period refers to women who are pregnant or in the first twelve months postnatal (NHS England.uk). Pregnant and postnatal mothers have vast information needs during this time and it is essential they are provided with and have access to trustworthy information. Throughout antenatal and postnatal care, women are presented with information from healthcare professionals (HCPs). Moreover, they participate in an information exchange process as they are encouraged to provide

personal information to HCPs at various time points of pregnancy and early motherhood.

2.1.1. Defining perinatal 'women'

In the context of this thesis the term 'women' will refer to the biological construct of 'sex' and being assigned female biology and the ability to bear a child as opposed to 'gender' which focuses on the social constructs of the roles assigned to a gender for example those related to being a 'mother' or 'parent' (Philips, 2005). Women referred to during this thesis will relate to those who are currently pregnant or have given birth to a child and who are biologically classified as female (sex). While research recognises the role of both adoptive motherhood (Fontenot, 2007), and non-binary, and transgender men parents (Tornello, Riskind & Babic, 2019) and how their route to becoming a parent and rearing a child may differ to that biological women's experience in terms of social stigma (Obedin-Maliver & Makadon, 2015), the current thesis will focus primarily on women who have experienced both pregnancy and motherhood, what information and support they sought and received socially and professionally and how technology assisted them to make sense of the physical changes relating to pregnancy, postnatal recovery they experienced.

Whilst acknowledging the role of fathers and partners as caregivers, the context of this thesis will focus on women who identify as 'mothers' and have experienced maternal support, antenatal and postnatal health care, and have physically experienced birth and postnatal recovery.

2.1.2. Information seeking during the perinatal period

New and expectant mothers rely on various resources to seek information throughout pregnancy and early motherhood. Information needs required by women throughout pregnancy include- foetal health and development, pregnancy and birth complications, pregnancy symptoms and effects of pregnancy on the body (Kamali et.al, 2018). To meet these information needs, resources mostly used are healthcare professionals, specifically 'discussions with midwives' (Grimes et.al, 2014), and family and friends (Kamli et.al, 2018, Ghiasi, 2021). Despite HCPs being a widely used information source, women also face barriers to accessing information and having their information needs met through pregnancy. Barrier's women face includes a reluctance to discuss personal pregnancy related issues with HCPs due to feeling ashamed or embarrassed, lack of communication with HCPs, reliance on self to seek information,

lack of awareness of appropriate information sources and inadequate information provided by healthcare professionals throughout pregnancy (Ghiasi, 2021).

It is evident that HCPs play an important role in facilitating information seeking for new mothers however, it is apparent that relationships between women and maternity healthcare providers affects how success or otherwise of the exchange of information (Syakhot, 2016). Women have shown reluctance to share personal information and receive information if the foundation of a trusting relationship has not been established. Mothers have rated HCPS as their main source of trusted information; however, family was the most common information source used (Dobele & Fry, 2017) showing that mothers rely on health professionals to provide trusted information but may face barriers (such as gaps between appointments) to accessing this source as a constant throughout the perinatal period.

For postnatal mothers, it appears that information needs are largely unmet by HCPs and mothers have reported feeling uninformed about what to expect with their postnatal care (McLeish et.al., 2020). Often turning to peer support and the experiences of other mothers to gain a sense of what to anticipate during labour, birth, and the postnatal phase. Women have voiced concerns around the lack of information provided in the antenatal period about postnatal care and hoped to be reassured by HCPs so they could experience a less stressful transition from pregnancy to motherhood, though often felt that postnatal care and information regarding this was low priority (McLeish et.al, 2020). New mothers expressed their expectations of postnatal care which appeared to differ from the reality, for example some women felt judgement or scrutiny from their postnatal HCPs but hoped to be reassured that they were doing a good job of caring for their baby.

A lack of focus on the mother's wellbeing during postnatal appointments with HCPs was experienced by mothers, who stated that a focus on physical checks of the baby was more visible (McLeish et.al, 2020). During labour and birth research has highlighted the matter of the 'invisible mother' where mothers feel less autonomy over decisions made during this time and a disconnect from receiving appropriate emotional support from health providers. For example, the decision to perform a caesarean section can leave feeling mothers invisible when they are not fully debriefed following the procedure or provided with emotional support from healthcare

professionals during it (Devries, 2017). Tyler & Baraitser (2013) discussed the changing culture of childbirth and the rise of the 'foetal celebrity' where the depiction of childbirth is marketed for entertainment in the media and the pregnant female body is a visual phenomenon in society. However, this does not acknowledge the emotional experiences of the 'invisible' mother that are attached to childbirth and rearing a child, healthcare professionals need to be aware of the societal impact on new mothers and offer support to meet the mothers' emotional needs as well as the physical needs of mother and baby.

Generally new mothers feel their postnatal care and information needs are unmet by HCPs, however some women reported that continuity of care from pregnancy and home visits with midwives can be advantageous to involving mothers in decision making and offering a personalised service (Walker, Rossi & Sander, 2019). Issues around breastfeeding are commonly experienced by new mothers due to a lack of education and support from HCPs, however when relationships have been built and effective communication is held between mothers and HCPs, the ability to seek and gain support is apparent. As the postnatal phase is an adjustment for new mothers, receiving care and information from familiar HCPs is beneficial (Finlayson et.al., 2020) and continuity of care from pregnancy to motherhood allows mothers to be supported by HCPs who can identify their own and babies needs during the early postnatal phase.

2.2. Maternal mental health and social support

2.2.2. Social support for maternal mental health

In addition to seeking information and support from health professionals, mothers also value the support of family, friends, and peers. The influence of social support on perinatal women's mental health has shown to improve quality of life and lower the risk of depression, particularly in the postnatal phase where symptoms of depression are higher compared to pregnancy (Emmanuel, John & Sun, 2012). Research has shown that women who had high levels of social support in late pregnancy were less likely to develop antenatal depression, and higher levels of social support in the early postnatal stages also reduced the risk of postnatal depression (Li et al., 2017).

This amplifies the positive impact and need for social support for mothers during pregnancy and after giving birth. The benefit of social support for mothers is also seen later in the postnatal phase, and mothers who received high levels of social support

were less likely to suffer depressive symptoms at six months post birth (Milgrom et.al, 2019). The advantages of social support are shown for pregnant and new mothers, specifically postnatal mothers where the risk of developing depression is higher than pregnancy. Receiving social support during the postnatal phase could be beneficial for mothers when contact and support received from health professionals is limited, specifically for later in the postnatal phase as midwifery care is usually completed one month post birth.

2.2.3. Partners experiences of maternal wellbeing and providing support

As well as social support from peers and friends, a woman's spouse or partner can also be a valued source of support throughout the perinatal period. When women experience mental health difficulties during this period, their intimate partners are often the first contact to seek support. Seeking support from partners can be advantageous to mothers' mental health (Lebert-Charron et.al, 2021), and mothers who have partners they perceive as available to offer help can lead to reduced symptoms of depression, anxiety and parental burnout. However, this is only effective if the partner is willing to offer support and share parental responsibilities, as mothers who perceive partners as less available are more likely to experience parental burnout (Lebert-Charron et.al, 2021). Partners who are found to offer support during labour often continue this into the postnatal period (Antoniuou et.al, 2021) which is valuable to mothers' postnatal mental health. Compared to support from wider family members, mothers specifically relied on the support of their spouses or partners during the prenatal phase as low support often led to increased risk of postnatal depression.

However, being a source of support can sometimes be detrimental to partners, who can display their own mental health struggles. Research on paternal mental health has shown that fathers can experience a decline in their mental health as they cope with the stress of navigating fatherhood whilst maintaining the need to provide support to their maternal partners, they often feel a lack of support tailored towards fathers specifically (Darwin et.al, 2017). Fathers can also struggle in gaining external support to help assist their partners when dealing with maternal mental health concerns (Mayers, et.al, 2020). This can sometimes lead to a decline in their own paternal mental health, highlighting a need for wider mental health services to provide support

and information to fathers or other relationship partners to help their maternal partners when dealing with poorer mental health.

To improve the wellbeing of mothers and partners simultaneously, interventions have focused on enhancing partner support in the perinatal period (Pilkington et.al, 2017) and preventing perinatal anxiety and depression. An online intervention ('Partners to Parents') was designed for couples to explore a website together which contained evidence-based information relating to partner support through pregnancy and parenthood and offered articles based on couples working together and providing support for each other's mental and physical wellbeing and was perceived as a useful resource from couples who engaged with it. This could be useful for future developments in healthcare services to focus on providing information and targeted interventions to improve the mental wellbeing of both mothers and their spouses and relationship partners.

In addition to providing support with child rearing, spouses or relationship partners can also encourage mothers to seek information throughout their pregnancy to become more aware of their maternal wellbeing. Guilleroy et.al,(2014) found that mothers who were in loving relationships with spouses or partners were encouraged to seek information online, specifically when the website was offering pregnancy related health information such as a nutritional health and gestational weight gain. Partners were found to be encouraging of new mothers to make informed choices about their maternal health. When using the internet to seek information during pregnancy and postnatally, women often share the information found online with their partners (Lagan, Sinclair & Kernohan, 2010) and participate in information sharing.

As well as encouraging seeking, partners have also shown to be actively involved in encouraging their maternal partners to make informed decisions about their antenatal and postnatal health care, however women's partners views on access mental health services and experiencing health professional support was mostly negative (Taylor et.al, 2017). Partners often feel excluded from the mothers' health care decisions and can feel neglected and underinformed about how to care for their maternal partners when struggling with postnatal mental health. Information needs specific to partners are largely unmet by health professionals leaving them vulnerable to offering support without being supplied with professional advice (Taylor et.al, 2017). This highlights

a need for partners to be supported and empowered to enable to offer good quality care and support new mothers particularly when experiencing poor perinatal mental health.

2.3. Online motherhood narratives and peer support

In addition to 'offline' support received from friends and family, new mothers have shown to value the experiential information in the 'online' world offered by other new and expectant mothers on internet discussion forums. Internet discussion forums offer a place for new and expectant mothers to share their experiences on topics such as breastfeeding (Lebron et.al, 2019); Pregnancy loss (Kuchinskaya & Parker, 2018); pelvic girdle pain (PGP) (Fredrikson, Harris & Moland, 2016); infant health (Chivers et.al, 2021) and emotions relating to motherhood (Pederson & Lupton, 2018). Seeking out experiential information can offer reassurance to new and expectant mothers and act as peer support, many women feel a sense of community when engaging with internet discussion forums.

2.3.1. Seeking experiential information during pregnancy

Seeking support and advice from other mothers on internet discussion forums appears to be the most common use of this platform. During pregnancy, expectant mothers can participate in 'Birth club' forums (Wexler et.al, 2020) which involves upon registering to websites or mobile apps such as 'What to Expect' then being grouped into online communities according to expected due date. The 'birth club' allows expectant mothers to seek support from other mothers at similar stages of pregnancy, the most common topic of discussion amongst mothers in the birth club was maternal health (Wexler et.al ,2020), this can be a valuable information source to mothers, seeking the lived experiences of other expectant mothers and dealing with similar pregnancy symptoms. Seeking this information could be useful to expectant mothers when they feel information provision is lacking and needs are unmet by health professionals (Lagan, Sinclair & Kernohan, 2011).

However, as information sought from online discussion is generally not evidence based or medically informed, pregnant women need to be aware of potential misinformation and take steps to seek trusted information when concerning maternal health issues. When seeking information, mothers are more likely to trust the information if the information is repeated across sources, for example if the same advice is provided by peers, HCPs and found online then mothers will likely deem this information trustworthy (Bernhardt & Felter, 2004). Gaining evidence-based

information is important in assisting expectant mothers in making informed decisions during pregnancy (Lagan, Sinclair & Kernohan, 2011) however use of internet discussion forums can also encourage the decision-making process during pregnancy. Women who engage in internet discussion forums can gain a sense of empowerment which can lead to make informed choices, such as choosing which hospital to receive maternity care, or deciding on which prenatal tests to have based on the experiences of others (Lagan, Sinclair & Kernohan, 2011).

Gaining advice from internet forums can lead to women partaking in shared decision making with their healthcare professionals due to feeling more knowledge about certain aspects of maternal health and maternity services. Seeking experiential guidance from others who have lived experience of general health conditions can impact the decision-making process, for example upon advice from healthcare professional, gaining an understanding of the outcomes of decisions made by others is important to offer reassurance of making the 'right' decision (Sillence & Bussey, 2017).

Examining the role of the internet in the decision-making process, Bussey and Sillence (2017) found that for pregnant women, being offered antenatal screening tests such as those used for detected downs syndrome, using the internet to both find further information using NHS sources, and gain access to the experiential advice of others in online discussion forums helped to make the decision-making process easier.Seeking reassurance from others when using internet discussion forums during pregnancy (Lupton, 2016) has shown to be beneficial to expectant mothers, helping them feel less alone, particularly when dealing with sensitive topics such as pregnancy loss (Kuchinskaya & Paker, 2018). Women can feel more knowledgeable from gaining information interacting in shared experience discussion on internet forums (Kuchinskaya & Parker, 2018) and relieved when they engage with others experiencing similar 'normal' pregnancy symptoms (Lupton, 2016). Although credibility of information can be lacking and women can be at risk of engaging with misleading information when based solely on the individual experiences of others (Ellis & Roberts, 2019).

Motivation for participating in internet discussion forums for pregnancy can include the vast amount of information provided on these platforms, women have shown to

seek out this information when they feel reluctant to seek information direct from health professionals to avoid wasting time or seeking advice that is deemed too 'trivial' (Ellis & Roberts, 2019). As pregnancy discussion forums are generally not monitored by healthcare professionals, information that is posted on them has the potential to be unreliable and potentially harmful to expectant mothers, especially when seeking health advice for symptoms such as pain or bleeding during pregnancy above contacting healthcare professionals directly (Ellis & Roberts, 2019). Healthcare professionals involved in maternal care during pregnancy must take steps to ensure expectant mothers be informed of the potential dangers of seeking online information and signpost to trusted information sources and raise awareness of when medical care is needed throughout pregnancy.

2.3.2. Sharing postnatal personal narratives online

Mothers use of internet discussion forums is also seen in the postnatal phase, the ability to post personal information under pseudonyms to maintain anonymity online appears to be utilised by women and perhaps acts as a prompt to encourage mothers to talk about experiences of motherhood in in the early postnatal phase (Pederson & Lupton, 2018). However, the narrative that new mothers often build and share online highlights the negative side to motherhood and dealing with the emotional and hormonal changes that occur after giving birth and the challenges that arise when caring for an infant child such as breastfeeding (Lebron et.al, 2019). Being a 'good enough' mother (Pederson, 2016) and even maternal regret (Matley, 2020) are also narratives that new mothers have displayed in online discussion forums. It was found that new mothers often disclose the emotional difficulties they experience postnatally and share the challenges of motherhood (Pederson & Lupton, 2018) and feel concerned they are not performing well particularly with challenges related to breastfeeding (Lebron et.al, 2019).

When creating online narratives in discussion forums, new mothers often begin by presenting snippets of personal information, for example when discussing postnatal depression (PND) they often disclose that they admitted to themselves they are struggling or experiencing PND symptoms (Jaworska, 2018). This is usually met with response from other new mums who may offer support or their own personal narratives of experiencing PND. Offering reassurance and support and can encourage and empower new mothers to seek medical advice from their health professionals or take

the first steps to arranging an appointment with their GP (Jaworska, 2018). Mothers who share birth narratives on internet discussion forums such as 'Mumsnet' occasionally use this platform to make sense of their birth experience, specifically if they have experience birth trauma (Das, 2017). However, sharing traumatic birth stories online can sometimes be discouraged by internet discussion forum users, preferring the positive birth stories to be shared as to not evoke fear or anxiety amongst other users (Das, 2017). Alternatively, mothers who discuss positive labour stories for example 'natural' births, quick labours or non-medical pain relief labours are actively encouraged (Das, 2017). Although this could help to reduce fear amongst users, it could have detrimental effects on those who experienced trauma or decided on medical pain relief, therefore the narratives new mothers display online potentially may not be representative of the true labour and birth experience and may alienate some mothers.

Noticeably, although new mothers appear to build a negative narrative about the experiences of early motherhood, the use of online discussion forums is seen to have positive outcomes as mothers value the support from peers and seek out experiential advice from other new mums (Chivers et.al, 2021). Like pregnancy, seeking reassurance from other new mothers in the postnatal phase is common amongst internet discussion forums (Chivers et.al, 2021). Support amongst new mothers on internet discussion forums such as 'Mumsnet' can offer encouragement to new mothers who sometimes display the narrative that they are not doing a good enough job or question if they are doing things 'right' (Lebron et.al, 2019). Breastfeeding mothers use internet discussion forums such as 'babycenter' to discuss the challenges associated with breastfeeding. Seeking advice relating to the breastfeeding included challenges such as milk supply and cluster feeding, practical information including milk storage and breast pumping; and physical effects of breastfeeding on the mother for example painful nipples during feeding (Lebron et.al, 2019). Sharing personal information and experiences regarding breastfeeding challenges prompts other users of motherhood discussion forums to respond with supportive advice and assurance and can help to normalise the challenges associated with postnatal issues in particular breastfeeding; this can lead to feelings of empowerment for new mothers (Chivers et.al, 2021).

Despite new mothers using internet discussion forums as an outlet to form negative narratives of their motherhood experiences, the use of such platforms has shown to be

beneficial to mothers. As advice is exchanged between mothers on online forums, solutions to the challenges to motherhood are conceptualised and this leads to feelings of empowerment amongst new mothers (Chivers et.al, 2019). These feelings of empowerment also produce further beneficial effects by improving maternal mental wellbeing (Chivers et.al, 2019), showing that online peer support in valuable to new mothers during the early postnatal phase. Overall, the use of internet discussion forums is valuable to mothers in the early postnatal phase, to share personal experiences and seek advice from other new mums to gain reassurance and support, however there is a potential risk of receiving misinformation on such platforms or relying on the advice of peers over medical advice from healthcare professionals. New mothers should be encouraged to participate in online forums for initial comfort however should be informed by healthcare professionals when to seek medical advice and reliable information.

2.4. Technology for women's health

As well as internet discussion forums, women have shown to use technology for various health information needs, for example tracking menstrual cycles (Levy & Romo- Aviles, 2019), pregnancy and motherhood (Balaam et.al, 2013), and menopause (Warke, 2021). Also referred to as 'Femtech' (female technology) (Wiederhold, 2021), technology for women's health is a rising industry and many digital tools are being developed to meet women's information needs and improve self-awareness of health changes over the female lifespan. The most common digital platforms women use to seek health information are search engines, websites, apps and social media however other technology such as wearables (e.g. Fitbit) and self-care devices are also used by women (Lupton & Maslen, 2019). Women describe digital health resources as being readily available and easy to access, which is beneficial when contact and appointments with health professionals are scarce.

2.4.1. Technology for reproductive health

To increase knowledge about health conditions, women often refer to online resources to fill information gaps received from health professionals (Lupton & Maslen, 2019). Using online discussion forums to gain peer support from other women experiencing similar lifespan conditions can be beneficial to women as they regarded these platforms can be a way of gaining information when it is lacking or difficult to access from healthcare systems. Technology devices such as wearables can encourage self-

tracking and self-awareness of health for women, who report having better knowledge and control over their bodies from being well informed and aware of bodily changes (Lupton & Maslen, 2019), however some women find that using such technology can have detrimental effects such as frustration when using wearables to maintain fitness. Tracking mobile applications such as pregnancy and reproductive health were commonly used amongst younger women and were found useful to gain information about maternal and infant health (Lupton & Maslen, 2019). Overall, using technology for women's health can be a beneficial way for women to become more aware and empowered over their own bodies and can lead to women making informed healthy choices.

For menstrual health, mobile apps have the beneficial feature of self-tracking which can be useful for women to identify fertile days and prepare for their upcoming period or be used as a form of natural family planning (Levy & Romo-Aviles, 2019; Broad, Biswakarma & Harper, 2022). Using digital platforms to track menstrual cycles can lead to empowerment for example by being self-aware of menstrual cycles can help women to not only prepare for periods but gain more knowledge and awareness of their bodies (Levy & Romo-Aviles, 2019). Tracking fertility using digital technology has shown to be a well-used method of contraception, however the efficacy of this method has been question, with half of women who reported using fertility tracking apps for contraception have experienced failures resulting in unexpected pregnancy, however when combined with other forms of contraception this can be improved (Al-Rashoud et.al., 2021).

Although fertility tracking apps have many positive outcomes, for example retaining cycle-related information to provide to health professionals when starting contraceptive medication and becoming self-aware of own personal health through tracking and observation mental and physical changes, it can also lead to some negative outcomes (Levy & Romo-Aviles,2019). Occasionally, tracking menstrual cycles can lead to distress specifically for cases when women experience irregular cycles (Levy & Romo-Aviles, 2019) or their period arriving earlier or later than expected (Broad et al, 2022). Some women also mention concerns regarding privacy and security of using mobile health apps due to the input of personal information. (Levy & Romo-Aviles, 2019).

2.4.2. Technology design for the menopause

Towards later in the lifespan, menopausal women also find the use of digital health tracking technology beneficial for this stage in life and mobile application are a prominent form of digital technology for this stage in the women's health trajectory. Throughout the three stages of menopause (perimenopause, menopause and post menopause) women experience several physical and hormonal changes however there appears to be a lack of education to prepare women for this (Warke, 2021). The development of current technology has proposed devices such as wearable clothing to assist with 'hot flushes', tools to encourage communication between menopausal women (Tutia, Balnon, Vu & Rosner, 2019) and a menopause diary (Warke, 2021) for women to write daily experiences of their menopausal journey. Women have discussed that potential technology devices or mobile applications would benefit from including personalisation, ease of use and understanding, have access to social support and be approved by health professionals (Trujilo & Buzzi, 2016). Women have reported having a lack of understanding of the transition to menopause and state that mobile applications targeted towards this life stage would benefit from including reliably sourced information and features to share information (Lee et.al, 2015). This would have the potential for women to be more knowledge of what to expect during the transition through the menopausal stages and could assist in better self-awareness of physical and hormonal changes.

2.4.3. Technology and the perinatal period

In the perinatal period technology use is evident, with mobile apps and social media being commonplace platforms to extract and share information. Similarly- to menstrual health and menopause, app use during pregnancy and postnatal has shown to be beneficial for tracking information related to infant development (Lupton, 2017) and brining awareness to the changes to expect over the duration of pregnancy to postnatal. Apps are used by women to extract pregnancy related health information and they particularly find personalised content appealing (Connor et.al., 2018). Women desire such apps to contain information on healthy lifestyle management throughout the perinatal period, and the information to be linked directly to trustworthy sources (Hearn et.al., 2013).

Pregnancy monitoring using mobile apps can impose dual use, users can input personal generated data (PGD) relating to their own health or on behalf of their child,

alongside extracting information from the content already available on the apps. Both aspects are popular with expectant and new mothers, who appear to enjoy inputting their own data to track using mobile app technology and value the information that can help to meet needs both antenatally and postnatally. Tracking via mobile apps through pregnancy allows expectant mothers to gain reassurance and knowledge of how their child is developing in utero.

Self-tracking during pregnancy to enable mothers to keep track of their developing foetus and having the ability to share this information with family or friends was something that women desired when using pregnancy focused mobile apps (Lupton, 2017). Gaining information from mobile health apps can empower women to make healthier choices during pregnancy, due to being aware of the potential risks associated with pregnancy, for example eating certain food types, and encourage women to avoid this risk to avoid harming their developing foetus (Lupton, 2017). Mobile health app use during pregnancy can encourage expectant mothers to make healthy choices such as taking prenatal vitamins and intaking healthy foods, improvement in the self-reporting of these behaviour was found in women after engaging with mHealh lifestyle apps (Overdijkink et.al, 2018).

In the postnatal phase, tracking apps are also popular amongst mothers. The 'Wonder Weeks' app which describes the developmental stages to expect during infancy, defined as 'leaps', and can help mothers and parents to prepare for changes in their baby's behaviour or feeding and sleeping patterns. Using apps such as 'Wonder Weeks' can help women to gain a sense of control and readiness when their baby is due to enter a developmental leap (Lupton, 2017). Apps that are created to support breastfeeding mothers have also shown to be successful amongst new mothers. The mobile app 'FeedFinder' was developed to allow breastfeeding mothers to locate breastfeeding friendly public places, share and review these with other mothers (Balaam et.al, 2015). The app helped to increase confidence in mothers to breastfeed in public and promoted positive breastfeeding experiences (Balaam, et.al, 2015).

Expectant mothers have also reported desiring mobile apps which contain information related to breastfeeding for example, milk production and supply, and advice for the challenges to be prepared for when breastfeeding (Demirci et.al, 2016). Offering emotional support to mothers who are experiencing breastfeeding challenges was

another desired feature women would like to have whilst using an app, along with relaxation and techniques for coping with these challenges, for example when comparing the reality of breastfeeding to the expectations (Demirci et.al, 2016). Women have reported desiring technology devices such as wearables designed for the perinatal period to enable easier tracking (Lupton, 2016). Features such as baby sleeping habits and to monitoring physical changes in the baby such as heart rate and body temperature were also desired by new mothers (Lupton, 2016), it was found that foetal and child development were the most required features on mobile apps (Lupton & Pederson, 2016). General technology use during early motherhood has shown to be encouraging for improving new mothers' confidence by providing quick access to information that women may be reluctant to source directly from health professionals, for example the asking of 'silly' or 'embarrassing' questions (Gibson & Hanson, 2013).

2.4.4. Information curation: Personal generated data vs data extraction

Use of the internet to find information during pregnancy and motherhood has shown to be common practice amongst women. During this phase women use the internet to extract information using search engines and websites (Jaks et.al, 2019) due to the appealing nature of immediately available information, and both the regularity and detail of information included amongst digital information sources (Lupton, 2016). Curating information (the process of seeking, selecting, storing and sharing information) from digital sources during the perinatal period allows women to increase knowledge of pregnancy development and child rearing which can lead to feelings of empowerment (Lagan, Sinclair & Kernohan, 2011). During the postnatal stage, new mothers use social media and online information seeking to fill the gap in health professional care information and support in the early postnatal phase (Newhouse & Blandford, 2016), particularly Facebook as a resource to seek information and connect with other new mothers in closed discussion groups.

As well as extracting information from online sources, perinatal mothers also use digital devices to store personal generated data (PGD). Personal generated data involves the collection of data from sources such as wearable technology for example gathering physical health data such as heart rate, or self-collecting (handwritten or via mobile device) data such as sleep or diet tracking (Brown et.al, 2022). Women use

mobile apps during pregnancy and motherhood to track their pregnancy and child development by inputting PGD into mobile apps, the ability to customise these apps is a valued feature to mothers (Lupton, 2016). Using digital sources to input and extract information is a useful method for perinatal mothers as it promotes information needs to be met, connection with other online mums, and seek support during gaps in care from HCPs.

For pregnant mothers diagnosed with health conditions such as gestational diabetes, recording PGD such as blood glucose levels on a mobile apps allows this information to be easily shared with HCPs and allowed feedback or corrections of health data to be provided which encouraged useful patient-HCP communication (Guo et.al, 2018). Women discussed sharing personal data with HCPS to encourage support to be given from midwives and communication to be easily prompted, however this was more likely to occur if a good relationship had been built between woman-midwife prior (Doherty et.al, 2020). The concern of 'objective and subjective' data was also raised by women, sharing 'objective' data such as blood pressure and weight was deemed easier to share than 'subjective' or self-reported data for example data pertaining to mental health and how midwives would interpret it (Doherty et.al, 2018).

During labour effective communication between women and healthcare professionals is essential to prepare mothers what medical interventions may be offered, or informed decisions made during this time such as the need for caesarean sections (Meyer et.al., 2016). Mothers found communication with healthcare professionals to be hindered when continuity of care diminished post giving birth, due to different HCPs offering varied information and explanations (Meyer et.al, 2016). An overall lack of communication from maternal healthcare professionals was found particularly when providing information to pregnant women regarding pregnancy complications and the outcomes on the baby, moreover women report a lack of opportunity to express concerns or ask questions to healthcare providers (Mannava et al., 2015).

2.5. Barriers to sharing and extracting information online

Although many expectant and new mothers choose to post personal information online, including narratives of experiences during pregnancy and early motherhood or inputting personal generated data (PGD) into mobile apps, concerns surrounding the privacy and security of sharing this personal data online are mixed. Sharing personal generated data has raised potential trust, privacy and security concerns, findings from

Brown et.al., (2022) demonstrated that sharing personal generated health data, particularly when the data was of sensitive nature, via social media was met with the greatest concerns, however most were willing to share this information with HCPs. Obtaining information online is a well-used method of meeting information needs during pregnancy and postnatal and this information seeking behaviour has shown to be more common amongst certain populations of new mothers than sharing personal information online (Zhu et al., 2019). Despite the popularity of extracting and sharing information online, privacy and security concerns have been raised, regarding who has access to personal information online, and if the information presented from online websites and search engines has been obtained from trusted sources.

2.5.1. Privacy and security concerns

Mothers post personal information relating to themselves including pregnancy symptoms, postnatal recovery, and mental health, however they also input information relating to their infant child, especially when participating in tracking their baby's behaviour such as feeding and sleeping and posting information on social media or internet discussion forums. Users of wearable technology to track and store personal health data such as Fitbit perceive privacy concerns as less serious than security concerns and the risk of personal data being shared with third party services without consent was a common worry of Fitbit users (Orlosky, et al., 2019). The use of mobile health apps has raised security issues including, breaches of data security (accessing medical data without authorisation from user), risk of cloud-based storage of personal health data to external internet 'attacks', low number of mobile health apps informing users of data security and privacy measures and many apps share user's information with third party services (Scott et al., 2015). Analysis of pregnancy tracking apps revealed that many apps had inadequate security protection measures and were at risk of cyber-attacks and leaked information (Jacobson, 2019). Although some pregnancy apps, for example BabyCentre (babycentre.co.uk) include privacy policies outlining how user data will be managed within the app and externally with third parties to minimise security risks (Barassi, 2017), users of such apps need to be aware of the potential risks that are associated with storing personal information on digital platforms.

From a mother's perspective, there are mixed concerns relating to the privacy and security of sharing personal information about themselves and their child online

(Orton-Johnson, 2017). Mothers gain a sense of relief and can feel empowered when sharing personal information relating to experiences of the emotional and physical challenges of pregnancy and motherhood however, there is a debate about the privacy of sharing information about one's children online and how they may react to seeing their information online when they reach an age to use digital technology (Orton-Johnson, 2017). Kumar and Schoenebeck (2015) introduced the term 'privacy stewardship' which explains that as posting information online from a mother's perspective is an archival process (storing the information to be accessed in the future) they must take responsibility for the information they choose to share online about their child to maintain their privacy or protect their identity.

Although this concept can create an awareness of appropriate online information sharing, many new mothers do not appear to exhibit a high level of concern regarding the safety of information they share in online domains such as mobile apps (Lupton & Pederson, 2016). It appears that the benefits of sharing information online, to partake in self-tracking through pregnancy and motherhood and sharing experiences to gain peer support, outweigh the potential risks of sharing personal content online. The concerns surrounding the need for privacy and potential privacy and security risks appear to be separate issues as new mothers enjoy being open about their pregnancy and motherhood experiences and sharing this online for others to see (Chalklen & Anderson, 2017). When posting in online settings such as social media sites, mothers engage in privacy protection behaviours for example restricting posts to family and friends only or creating private profiles. However, once using the platform to share information they do not appear to have privacy concerns regarding the personal information they share in a bid to be transparent about their motherhood experiences (Chalklen & Anderson, 2017).

Privacy concerns can also be altered depending on the platform to which the information is being shared. Mothers are less open and more concerned about protecting their privacy when using open platforms such as online discussion forums (Vik & Degroot, 2020). Whereas on personal social media sites or mobile apps, it appears that mothers are less guarded to the personal information they share. However, mobile apps and social media profiles often require a large amount of personal data to create personal profiles and access to the app. It is often unclear as to how private this information is or with whom this information is shared from the provider perspective

(Lupton & Pederson, 2016), therefore mothers using these domains need to be aware of the potential risks to their personal information.

2.5.2. The impact of misinformation

When seeking information using digital sources, the risk of misinformation is prevalent, with many mobile apps and social media sites not being regulated for privacy and security issues or being monitored by health professionals to ensure evidence-based information (Lupton & Pederson, 2016). Many women who use the internet to seek pregnancy information report few concerns about the quality of the information and state that the information they find online is generally reliable (Al-Dashan et.al, 2022). However, despite finding the information sought online to reliable, this is often not shared with health professionals (Larsson, 2009; Gao, Larsson & Luo, 2013), as healthcare providers have shown to be unsupportive of online information found by pregnant mothers due to not being able to regulate the information or have time to guide women through reliable sources during appointment time (Narasimhulu, Karakash, Weedon & Minkoff, 2016). Women may be reluctant to share this information due to the unreliable nature and the risk of accessing misinformation online.

The threat of misinformation is an aspect of online information seeking mothers must be aware of, particularly when using internet discussion forums to gain experiential advice as a preference to seeking information directly from health professionals. Breastfeeding mothers for example, use health forums or social media groups to gain access to information and advice from peers online, however this presents a risk of mistaking personal experience of peers for medically informed accurate information (Snyder, Pelster and Dinkel, 2020). Health professionals must therefore be aware of the potential impact of misinformation and ensure that perinatal mothers are provided and signposted to trusted sources of information or offer support and verification to mothers who find information online.

2.5.3. Digital inclusion for motherhood

A further potential barrier to seeking and sharing information digitally, focuses on low-income mothers and accessibility to digital resources. Digital inclusion covers three components; Digital skills (being able to use digital devices), Connectivity (access to internet through broadband, Wi-Fi and mobile) and Accessibility (services designed to meet all user's needs, including those dependent on assistive technology)

(digital.nhs.uk). Concerns raised for low-income mothers is that they are at risk of being digitally excluded due to having less access to internet sources, especially as the switch to digital maternity services are becoming increasingly prevalent for example digitalising maternity notes in pregnancy (digital.nhs.uk).

Research on low-income mothers' access to online information has shown that with the implementation of internet enabled smartphone, this access has improved, and mothers are benefiting from internet use to seek information in the perinatal period (Guerra-Reyes et.al, 2016). Yet, a 'digital divide' appears to present (Zimmerman, 2017) between low-income mothers and those who have increased access to digital technology. Specific to app use, many low-income mothers found the fees associated with accessing content on pregnancy and postnatal apps to be excluded and felt excluded from retrieving further information due to the cost barrier (Guerra-Reyes, et.al ,2016).

For some mothers, the digital divide could be detrimental as the risk of being exposed to poorer quality information could lead to a decline in maternal health as mothers in this category were more inclined to seek information from less reliable or informal sources (Zimmerman, 2017). However, due the risk of being exposed to poorer quality of information online, it was found that low-income women use health professionals as their main source of information which could be advantageous to ensure trusted evidence-based information is being provided. Using the internet for digital health management was also less apparent amongst low-income mothers, who appeared to use the internet to gain information for example from websites (Guendelman, 2017).

However, using other forms of digital technology such as apps to manage and maintain perinatal health was less common as mothers showed a preference for speaking with a health professional in person to manage their own and child's health (Guendelman, 2017). Overall, digital inclusion for motherhood is essential for perinatal mothers to have access to online information, low-income mothers appear to have internet enabled smartphones for access to the internet but are less likely to use other forms of digital technology such as mobile apps for tracking or sharing personal data. Low-income mothers show a preference for direct contact with health professionals, however due to digitally evolving maternity services and the switch to online medical

notes, low-income mothers would benefit easier access to all forms of digital technology in the antenatal and postnatal phases.

2.6. The role of healthcare professionals in perinatal care

Currently in the UK, NHS maternity services offer a structured care plan to expectant and new mothers. First time mothers are offered up to thirteen (up to ten for second time plus mothers) antenatal appointments including two ultrasound scans to date the pregnancy and check foetal health. Postnatal mothers receive up to three home visits after giving birth from a midwife, which is then handed over to a health visitor to continue care for mother and baby, and GP appointments is offered around six to eight weeks to examine the health of both mother and baby. During this time various screening tests for baby are offered (nhs.uk).

2.6.1. Use of communication technology in midwifery care

From the perspective of maternity healthcare professionals, the use of information communication technology (ICT) in maternity services has produced both barriers and facilitators. Midwives have reported awareness of antenatal patients using internet sources to seek health information during pregnancy (inclusive of low-income mothers), however using ICT in their own practice has raised concerns. Lagan, Sinclair and Kernohan (2011) reported that midwives acknowledge that women are increasingly using the internet for information seeking, however were cautious about the accuracy of information found online and made efforts to signpost women to trust online sources. For midwives using the internet as a direct source of communication with women, a lack of skills around communicating effectively via social media, including and the ability to demonstrate appropriate tone for effective communication was raised as a concern (Dalton, Wilmore, Humphreys & Clifton, 2014).

Although provision of information via information technologies was approved by midwives, time constraints concerns were discussed by midwives, for example the uploading of information to social media pages or signposting women to online information during appointment times was difficult during the time limited face to face contact at antenatal appointments (Dalton et.al, 2014). Time limits was also mentioned as the main obstacle to internet use within midwifery practice (Lagan, Sinclair & Kernohan, 2011). Barriers to time pressures in maternity services also raised issues of poor decision making due to lack of time to provide enough resources or communicate effectively via digital technology platforms (Dalton et.al, 2014). That has the potential

to encourage women to seek unreliable sources of online information and increase risk of being exposed to misinformation, leading to inadequate decision-making choices.

2.6.2. Shared and Informed decision making in maternity healthcare

Shared decision making is a process whereby patients and healthcare professionals work unanimously to decide how treatment and care will be provided (NHS England). Shared decision-making involves provision of information from HCPs to inform patients and allow a collaboration to involve patients in the decisions made regarding their health (Elwyn, Durand, Song et.al, 2017).

As well as provision of essential information, communication between mothers and HCPs can also impact how productive the shared decision-making process is, women expect HCPs to participate in 'open and respectful' communication and encourage patient autonomy over health-related decisions (Vedam et.al, 2019). Communication is also important for doctor-patient relationships to encourage shared decision-making, particularly when patients share health information found online with doctors (Bussey & Sillence, 2019). If patients receive a negative response from doctors upon sharing online information this can impact the relationship and affect how patients perceive the shared decision making and having input into decisions made around healthcare treatments (Bussey & Sillence, 2019).

Informed decision making allows women to have autonomy in the choices they make for a healthy pregnancy, birth, and postnatal recovery. Shared decision making often occurs between women and health care professionals during pregnancy to ensure the health of mother and baby, however informed decision making allows the mother to make choices independently (Kloester, Willey, Hall & Brand, 2022). Informed decisions allow women to make decisions about their care plan under the guidance and medical advice of their healthcare professionals. Facilitation in informed decision making was something midwives stated as important in clinical practice and were committed to the process to empower women in making informed choices during pregnancy (Kloester et.al, 2022).

Support and guidance are offered to mothers during the informed decision-making process, with the main goal of midwives being to empower women to make their own choice regarding healthcare throughout the perinatal period through the provision of information (Kloester, et.al, 2022). Despite this, midwives have acknowledged that

informed decision making often did not occur due to insufficient information provision to women, other barriers such as lack of training, knowledge and risk of blame were voiced as concerns midwives had around the informed decision-making process (Kloester, et.al, 2022.

Building trusting relationships with antenatal care providers during can empower women to make choices about labour and birth, due to multidisciplinary health professionals becoming involved during labour and birth. Hospital HCPS can facilitate informed decision making by communicating the mothers needs and wishes effectively to other team members to ensure a safe and positive birthing experience (Jacobson, Zlatnik, Kennedy & Lyndon, 2013. Overall, it is important that antenatal healthcare providers encourage informed decision making and receive the correct training to do so as this can lead to building better relationships with women and encourage women to make informed choices to ensure the health of themselves and baby.

2.7. Impact of Covid-19 on perinatal health and NHS digital strategies

2.7.1. Implementation of technology to maternity services

Since the Covid-19 global pandemic, many maternity services have seen the utilisation of digital technology as face-to-face contact was limited in healthcare due to periods of lockdown. A shift towards telehealth (the use of digital technology to gain access to healthcare services) was introduced to maternity services during the pandemic to maintain access to prenatal healthcare (Jakubowski et.al, 2021). In the UK, many aspects of maternity services were affected by the Covid-19 pandemic including a reduced number of antenatal appointments, closure of midwife led units, fewer resources to allow home births and the use of telephone calls and video software to conduct antenatal and postnatal appointments (Jardine et.al, 2020). A reduction in midwife-led postnatal appointments was also seen, due to staff shortages auxiliary staff or students would often conduct postnatal appointments with new mothers (Jardine et.al, 2020). Mothers also reported a lack of contact and support from HCPs during lockdown periods and the shift to digital appointments, inaccessible internet and reduced physical checks due to online nature of appointments left mothers feeling less satisfied with care (Das, 2022). A sample of UK mothers felt that the human aspect of care felt in person had diminished as use of technology hindered the decision-

making process and lack of physical contact resulted in less support for new mothers when facing challenges such as breastfeeding (Das, 2022).

Alike to the UK, a European study found that the implementation of telehealth in prenatal healthcare services during Covid-19 resulted in expectant mothers facing difficulties accessing medical care during pregnancy, however the standard of prenatal care given in person compared to online or hybrid remained the same (Jakubowski et.al, 2021). The use of telehealth appointments in maternity services during the covid-19 pandemic allowed reduced in person contact between patients and maternity healthcare professionals as most screening and testing procedures could be done in clinics while routine and follow up appointments throughout pregnancy could be done virtually. This allowed less exposure to the Covid-19 virus reducing the risk for expectant mothers to become infected as it was reported that some expectant mothers experienced heightened anxiety when visiting healthcare facilities during this time (Jakubowski et.al, 2021).

As well as prenatal care, postnatal care also adopted telehealth with most healthcare appointments taking place during the Covid-19 pandemic with new mothers occurring virtually or via digital technology (Madden et.al, 2020). Although the use of telehealth in maternity services was perceived as a reduction in access to prenatal healthcare, benefits of the transition included records being kept electronically and documented during virtual appointments and follow up appointments made more efficiently. (Madden et.al, 2020). For women experiencing complications during pregnancy, telehealth was found to be problematic due to the concern of missed information during telehealth consultations (Flaherty, Delaney, Matvienko-Sikar & Smith, 2022). During postnatal consultations, many new mothers found issues related to breastfeeding and mental health difficult to discuss with their healthcare professionals describing the process as ‘awkward’ (Flaherty et.al, 2022).

The uncertainty of appointment structure,limited or no access to birthing pools and lack of face-to-face contact during the Covid-19 pandemic led to a mistrust of health professionals and reduced satisfaction in maternity care (Flaherty et.al, 2022). Overall, the use of telehealth for maternity services during the Covid-19 pandemic highlighted mixed findings. Although some mothers found the switch to digital maternity services useful, by reducing in person visits and less exposure to Covid-19, satisfaction with

antenatal and postnatal care appeared reduced with the digital switch affecting the relationship between mothers and healthcare professionals and leading to a reluctance to share personal information via a digital setting. Some midwives viewed this reduced face to face attendance at appointments as a barrier to healthcare. Midwives expressed that the human aspect of in person contact with women during pregnancy and postnatal was essential to delivering maternity care (Flaherty et.al, 2022). Overall mixed views from maternal HCPs were shown in response to telehealth, some highlighted the aspect of easier access to continuity of care whereas others viewed the technology as a hinderance to building a trusting relationship with women which reduced the efficacy of maternal healthcare.

2.7.2. Covid-19 impact on maternal mental health

The transition to telehealth care for antenatal and postnatal services negatively impacted the mental health outcomes for some mothers, with reports showing mothers experienced stress, anxiety, and dissatisfaction with their maternal healthcare during the Covid-19 pandemic (Flaherty et.al, 2022). Many women experienced cancelled or postponed maternity appointments during the Covid-19 pandemic which led to increased uncertainty of maternity care and contributed to the heightened anxiety and stress mothers were experiencing during this time (Flaherty et.al, 2022).

The impact of Covid-19 lockdown phases and social isolation resulted in adverse outcomes for women's perinatal mental health. A lack of support from healthcare professionals was reported in women which impacted feeding decisions for their child in the postnatal phase, women reported ending their breastfeeding journeys earlier than expected and this directly affected their mental health (Das, 2021). Due to periods of lockdown and social isolation, new mothers also found it difficult to seek support from family and friends and found it difficult when attending maternity services alone (Das, 2021). New mothers also experienced a delay in referrals to external services for infant health which led to an increase in anxiety during this time. Suwalska et.al (2021) identified risk factors that led to an increase in maternal mental health during the Covid-19 pandemic which included uncertainty about perinatal healthcare, changes in antenatal and postnatal appointments, social factors (isolation and lack of support) and financial (low income) and risk of Covid-19 infection.

These factors all contributed to higher rates of both anxiety and depression amongst perinatal women during the Covid-19 pandemic. An increase in anxiety symptoms

also increased the level of information seeking among perinatal women referring to sources such as social media and news sources, with concerns relating to the Covid-19 infection and the risk to both mother and baby (Basu et.al ,2021). Perinatal mothers have shown to be negatively affected by the Covid-19 pandemic.

2.7.3. Digitisation of maternity services

During pregnancy, expectant mothers are expected to keep their notes, usually presented in a paper-based folder. Advances in digital maternity services have led to the implementation of a digital version of these maternity notes via a mobile app named Badger Notes. During pregnancy or after giving birth, new mothers are also presented with a personal child health record book (red book) from their health visitor (RCPCH.ac.uk). The 'red book' is kept by the parent or guardian of the child and is kept as a development record and used by various health professionals and covers ages 0-5 as part of the health visiting service. The NHS currently offers a digitised version of the red book (named the eRedbook) in the form of a mobile app which parents can download free of charge (eredbook.org.uk). The initialisation of the eRedbook is expected to improve parents understanding of their child's health, encourages collaboration between services, enable the digitisation of child health services, and improve quality of care (gov.uk).

Current strategies of UK digital maternity services anticipate that by 2024 all women will have access to their maternity notes via smartphones or other devices as part of the 'Maternity Transformation Programme' (digital.nhs.uk) and the 'Better Births' 5-year plan to improve quality of care in maternity services (Cumberland, 2016). The implementation of digital services is expected to improve communication and sharing of information between health professionals and patients to improve women's experiences of maternity care in the UK (digital.nhs.uk). Digital schemes for UK maternity services include the 'Women's digital care record' (digital.nhs.uk) which aims to replace paper based maternity notes with a personalised digital version for women to access throughout antenatal and postnatal phases. The mobile app BadgerNotes was introduced in Northeast England in 2018 as part of an NHS long term plan to empower women to manage their pregnancy and health (longtermplan.nhs.uk).

2.7.4. eRedBook and BadgerNet app

Prior to the introduction of the eRedbook in the UK, a pilot study highlighted use of the digital child health record from a user perspective showed that issues around registration to an app or website version of the eRedbook, security of information stored digitally, lack of access to technology resources in low-income areas, and digital literacy skills among health visitors introducing the eRedbook during appointments was perceived as potential barriers to use of the digital record (O'Connor et.al, 2016). Information stored in the eRedbook is stated to be stored on a data secure online server in the EU, and users are required to produce complex passwords for additional data security (Gibson, 2016), however limited research on the eRedbook after implementation in the UK is available to assess the success of this digital child health record book among parents.

Little research has look at the efficacy of the Badgernet maternity notes app, introduced to UK maternity services in 2018 to replace current paper based maternity notes. However, findings from a study investigating antenatal diabetic services during Covid-19, emphasised that many patients had difficulties accessing the Badgernet maternity app (Sarre, et.al, 2021) and preferred to use other sources to gather information. Users of the app suggested improvements to the app for example including a section to document their birthing plan (Sarre, et.al, 2021) after raising an issue of the app being slow to update.

Although it is evident that plans to increase digital maternity services have been adopted, research assessing the usefulness and effectiveness of online maternity notes and child health record documents (Badgernet maternity app, eRedbook) is limited. Potential barriers to storing information via digital platforms has been raised, along with concerns around digital inclusion and accessibility of digital resources to all UK based mothers, is an area that warrants future research to examine further barriers and facilitators to use of digital technology in maternal healthcare.

2.8. Chapter Summary

The chapter has provided an overview of the literature covering three main aspects to understanding perinatal information seeking; 1) identifying what the current information needs of pregnant and postnatal mothers are, 2) what sources are used to meet these information needs and 3) how the role of technology can facilitate and create barriers to accessing information and finally what the role of health

professionals are and what they currently offer as means of support and information to perinatal women. This chapter has shown that women use mixed sources of support to seek information during the perinatal period including family and friends, healthcare professionals and digital sources such as internet, social media, and mobile health apps. Although information needs for perinatal women have been identified, there is little understanding of how these information needs change along the pregnant to postnatal journey. Literature has highlighted the need for additional information around labour and birth however, it is unclear which other time points of pregnancy and postnatally where mothers require information most and what the most useful sources of information are to meet needs during these time points.

Barriers such as the risk of misinformation and unreliability, lack of continuous access to HCPs information and support across pregnancy and postnatal, and the privacy and security risks associated with storing personal information online have been identified. The role of UK maternity healthcare professionals (primarily midwives and health visitors) in providing support and information to perinatal women has been identified including how relationships with women can impact communication and exchanging of information, however findings are limited in knowing how UK healthcare professionals currently view the structure of maternity care and what their perspective is relating to 'gaps in care', the digital evolution of maternity services and how relationships are built with women and how information exchanged is encouraged. Previous literature has shown the development of digital maternity services in the NHS, however less is known about how women perceive the idea of digital storage of personal medical information and information relating to their child, for example through introduction of the eRedbook.

This thesis aims to address these gaps in literature by gaining further understanding through a mixed methods approach of the current information needs and the role of technology in facilitating such needs including: how perinatal women identify their changing information needs from pregnancy to postnatal and how such needs are met by 'online and offline' sources (Study 1 and 2), how UK healthcare professionals view the current structure of perinatal care and information provision, and how HCPs encourage women to share personal information when continuity of care is not possible (Study 3), a look at what digital sources of information (mobile health apps) for motherhood are currently available and how women perceive their usability (Study

4), and what factors predict the use of digital information tools for storing personal information (Study 5).

Chapter 3: Study 1: Examining information seeking, technology use and relationships during pregnancy and postnatal

3.1. Introduction

Online health information seeking can be valuable during personal life changing events such as pregnancy and becoming a new mother. Pregnant women enjoy monitoring their own health information alongside fetal growth during the various stages of pregnancy (Johnson, 2014). Instant access to online data in the form of pregnancy related mobile apps was found most beneficial to pregnant women due to immediate information access regarding specific pregnancy symptoms (Johnson, 2014; Lupton & Pederson, 2016). Pregnant women use mobile apps to make up for insufficient information provided during prenatal visits with health providers (Lupton & Pederson, 2016). Both in pregnancy and early motherhood, women reported finding the use of online information sources and health apps very helpful and specifically appreciate the support networks formed with other expectant or new mothers (Lupton & Pederson, 2016).

3.1.1. Support from technology

Online social support can be gained using social media and mobile apps during pregnancy and early motherhood. This support is desired as it has shown to increase maternal health, child development and coping as a new mother (Newhouse, 2016). Information sharing online can lead to feelings of empowerment amongst pregnant women, who feel more in control over their changing bodies and know how to prepare for their child (Johnson, 2014). A need for greater access to advice and support from health professionals that could incorporate digital media was sought from women experiencing pregnancy or motherhood (Lupton, 2014). This is something that health professionals (HCPs) need to be aware of to provide additional support when caring for expectant mothers, as lack of support from health professionals was found to be an issue during prenatal visits (Lupton, 2016).

Mobile apps and social media platforms not only provide the opportunity for social support but can also provide educational needs and can be useful to monitor health information in case of intervention requirements. Women describe a ‘gap in care’ during the first trimester of pregnancy as many do not receive prenatal care until about ten weeks gestation (Peyton et.al.,2014), therefore health apps containing relevant

information to ensure healthy pregnancy from the beginning is essential. Lagan, Sinclair and Kernohan (2011) found that online information seeking occurred when information needs were unmet by health professionals and that infrequency of antenatal appointments encouraged expectant mothers to search for information online to meet their needs. Not receiving medical care or intervention in these early stages of pregnancy can also present a risk for the development of pregnancy related health issues such as gestational diabetes caused by excessive weight gain (Peyton et.al., 2014).

Though technology can be beneficial to meet the information needs of expectant and new mothers, caution often needs to be taken and online sources can result in being untrustworthy or of low quality. Health apps that focus on pregnancy nutrition can be unreliable and contain inappropriate information (Brown, Bucher, Collins & Rollo, 2019). Pregnancy apps are seen to be very favourable among expectant mothers, for example Babycenter is said to contain the most relevant information (Walker et.al., 2017), therefore if women are choosing to use mobile apps, they must be cautious of using reputable and trusted sources to get the best quality information from them.

Mobile eHealth apps can help to encourage healthy lifestyle choices; however, use should be monitored by health professionals to ensure pregnant women are provided with the most helpful and useful information. NHS UK currently promote the app Baby Buddy to expectant mothers, which contains information about maternal and foetal health during pregnancy up to six months postpartum (NHS UK). The app contains an 'Ask me' feature which aims to answer pregnancy related questions with expert information. It is evident that technology can play a role to fill the gap in care stemming from a lack of antenatal appointments with a health professional (Kraschnewski et al., 2014), and mobile applications such as Babycenter, forum use and general use of search engines to look up specific pregnancy symptoms and baby related information was heavily used by pregnant women. However, this research only focused on pregnancy and did not consider how patient care is structured after giving birth and how technology can aid in the information needs of a new mother, as postpartum is a period where information needs are prevalent.

3.1.2. Relationship with HCPs

Although online information seeking can be beneficial to fill gaps in care and provide expectant and new mothers with additional knowledge, women can often feel reluctant to share the information found online with their prenatal health professional

(Sayakhot, 2016). This could be due to issues around misinformation online or lack of trust with potentially unreliable online sources, however health professionals must be aware of this information seeking practice to encourage information exchange with patients. However, while women appear to be unwilling to share online information with their health professional during pregnancy, it was discovered that women regarded 'discussion with midwife' as the greatest source of information throughout pregnancy (Grimes, Forster & Newton, 2014; Weston & Anderson, 2014) therefore face to face antenatal appointments are still an important opportunity for information exchange during pregnancy. Like pregnancy, postpartum appeared to also be a time where new mothers felt their information needs were unmet by health professionals, which prompted further information seeking using online sources (Grimes et.al, 2014).

3.1.3. Postnatal information needs

During the postnatal period, the transition from pregnancy to motherhood can prompt many women to seek information surrounding topics such as breastfeeding, sleep schedules, post-partum self-care, and mental health. Despite attending antenatal classes and receiving information surrounding postpartum care, it is apparent that women still desired additional information after brining their baby home (Sink,2009), perhaps due to the shift in role and responsibility of caring for a new-born and focusing on postpartum recovery. Issues around breastfeeding can arise soon after giving birth and lack of support from health providers can lead to women finding support and information elsewhere. Solving breastfeeding problems such as latching and establishing breastfeeding, tongue tie and infant health issues were the pressing difficulties most mothers sought out help for (Guerra-Reyes et al., 2016).

The first six weeks postpartum is identified as the period where new mothers desire most information and support (Henshaw et al., 2018). During this time, new mothers report having low confidence which encourages further information seeking, however searches may lead to incoherent and conflicting information. During the postpartum period, when visited by health providers at home, the emphasis on information and support was largely centred on infant needs and lacked detail around post-partum physical and mental health care for the new mother. Postpartum mothers also described a lack of support to prepare them for the symptoms which occur after delivery such as vaginal bleeding, C-section pain, urinary incontinence and hair loss (Martin et al., 2014). It was suggested by postpartum mothers that a written

supplement given by health providers at antenatal checks, should include information on postpartum health and what physical changes to expect- helping women feel more prepared and equipped to deal with symptom and care for themselves (Martin et.al, 2014).

Mental health needs and preparation for post-partum changes to mental health were recognised as a gap in information knowledge. New mothers expected, to have been better educated about mental health concerns, during pregnancy (Henshaw et.al, 2018). Inadequate preparation can lead to postpartum depressive symptoms (Howell et al., 2010), addressing a need for information to be provided in the antenatal period to prepare expectant mothers for the physical and mental changes that occur postpartum. Postpartum physical changes, self-doubt as a new parent, and sleep disruptions can all initiate anxiety, and many postpartum mothers use the internet to seek information about this anxiety (Kirby et al., 2018).

3.2. Rationale

Research has shown that during pregnancy and early motherhood, mobile health apps and social media can be a beneficial tool for social support, education, information seeking and health monitoring. However, most evidence appears to focus on a specific time of pregnancy and postpartum, therefore understanding how information seeking, relationships with HCPs and interaction with technology changes over this time frame is difficult. Knowledge of mothers' perceived benefit of specific technology use and interaction with health services over the pregnancy and postpartum spectrum is relatively unknown therefore the present study will aim to understand this from different mother's perspectives.

Therefore, the current chapter will aim to outline an initial study that explored through qualitative methods, (1) how expectant and new mothers seek out information. (2) Explore how technology use can lead to improved healthcare and increased communication between expectant and new mothers and health providers and (3) discover what the implications of this may be for future health practice. The current study will expand the findings of previous literature to cover postpartum as well as pregnancy, as this has been highlighted as a time where mother's information needs are high yet support and information from health professionals appears to be lacking.

The current study aims to address the following research questions:

1. How does information seeking, and information exchange occur throughout pregnancy and postpartum and, how does this change with health professional relationships?
2. What role does technology play in facilitating these relationships or meeting information needs of expectant and new mothers?

3.3. Method

3.3.1. Participants

Ten women who were either pregnant or had given birth in the previous twelve months were recruited to take part in interviews regarding their pregnancy/post-partum information seeking behaviours. Participant demographics shown in Table 1.

Table 1: *Participant demographics*

Participant no.	Stage of pregnancy/postpartum	Child no.	Location	Age
Participant 1	Third trimester	First child	Newcastle	25-30
Participant 2	Third trimester	First child	Northumberland	25-30
Participant 3	Second trimester	First child	Northumberland	35-40
Participant 4	Second trimester	Second child	London	30-35
Participant 5	6 months postpartum	Fourth child	Northumberland	25-30
Participant 6	Third trimester	First child	Northumberland	30-35
Participant 7	4 months postpartum	First child	Newcastle	30-35
Participant 8	10 months postpartum	First child	Northumberland	25-30
Participant 9	12 months postpartum	Second child	Northumberland	25-30
Participant 10	1 month postpartum	First child	Newcastle	25-30

A semi structured interview schedule was devised to cover the pregnancy and postpartum timeline but was flexible to explore individual circumstances of each participant. Topics included: (1) pre-pregnancy information seeking and technology use, (2) current information needs, (3) patterns of information exchange with HCPs,

(4) relationship with HCPs, (5) technology use along the timeline and (6) opinions of developing an app to improve communication with HCPs.

3.3.2. Procedure

Interviews took place at a venue of the participant's choice which included, at home, in a public area, or via FaceTime. Participants were provided with participant information sheet and consent form. Information sheets and consent forms were sent via email to participants being interviewed via FaceTime, which were signed and returned to the research prior to interview commencing. Participants were asked questions following the interview schedule which ranged from 30 minutes to 1 hour. Upon completion of interview, participants were given a debrief form explaining the aims and nature of the study, sent via email for FaceTime interviews.

3.3.3. Sampling

A purposive sampling procedure was used. Participants were recruited through personal networks and social media. All ten women were White British and mostly lived in Northeast England except for one participant who lived in London, England. Although this sample was mostly representative of the Northeast England, it is understood that 'Newcastle' and 'Northumberland' are operated from different healthcare trusts therefore the information and support provided by each specific trust could vary. Seven out of ten of the recruited women were first time mothers and three second time+, therefore had varying levels of experience of motherhood, but most participants were experiencing pregnancy or motherhood for the first time. All participants stated they had partners who lived with them and none of the sampled mothers were single. It was felt after recruiting ten participants that data saturation had been achieved, previous literature that this can be achieved with a sample size between 9-17 interviews (Hennink & Kaiser, 2022). After interviewing ten perinatal women it was decided that enough data had been collected to give an overall reflection of this sample and to make timely progress onto the next stage of the thesis.

3.3.4. Data collection

All interviews were recorded using the 'Easy voice recorder' mobile app and transcribed into written text. Thematic analysis (Braune and Clarke, 2006) was used to analyse the data. Nvivo was used to code the data. Whilst analysing the data, it was evident that the information work of new mothers varies greatly across the timespan from early pregnancy to postnatal. Therefore a timeline approach was adapted to reflect the journey of changing information needs and support across the perinatal

trajectory as it was evident that the participants could not simply be grouped into either 'Pregnancy or Postnatal' as technology use and support from HCPs can overlap (See Figure 2). As the study incorporated a timeline approach from pregnancy to postpartum, the analysis was structured around these time points and an inductive approach then taken to the data at each of these time points. Therefore, general themes were identified as milestones along the timeline with sub themes conceptualised at each stage. The six stages of thematic analysis (Braun & Clarke, 2006) were implemented to code each transcript, codes were then grouped into themes and discussed between the research team. Each theme highlighted how perinatal women work with information at each stage along the timeline. It was noticeable that along the timeline, gaps in care from HCPs (such as fewer appointments) coincided with increased technology use (as shown in figure 2).

3.3.5. Ethical issues

Ethical approval for this study was granted by Northumbria University Ethics Committee and ethical consideration was given throughout the course of data collection, informed consent to record and transcribe participant data was given prior to the interview commencing. To protect anonymity for each participant, pseudonyms were created for both participants and any personal names (such as name of child) that were mentioned during each interview.

3.6. Results

Results of the study showed that expectant and new mothers' journey through a timeline of information seeking needs and technology use throughout pregnancy and early motherhood. Technology can both facilitate the relationship between mother and health professionals or be used as a stand-alone tool to discover information when it is lacking elsewhere. When expectant mums first discover they are pregnant, information seeking is often sought through technology and information needs are generally baby focused, with foetal growth often being the focus at this early stage. Once pregnant women are introduced to their midwife, the health professional relationship begins to develop, and it is evident that most information exchange occurs around mid to late pregnancy. Information exchange involves the seeking and sharing of information between expectant mum and health professional. Often a sense of trust begins to cultivate where continuity of midwifery care occurs, as new mums are more

likely to share personal information with a health professional they trust and are familiar with.

However, in mid pregnancy it was identified that a gap in midwifery care prompted women to use technology to find out information about foetal growth and development, though this information was subsequently used to clarify with midwives during appointment time. Although midwife appointments increased later in pregnancy which encouraged women to engage in information exchange with health professionals, it was revealed that preparing expectant mums for labour or what to expect postpartum is generally limited. NHS antenatal classes are provided however they are often felt too brief to assist in preparation for labour and postpartum, often online information occurs at this point in pregnancy to help expectant mums feel more empowered and knowledgeable about what to expect during labour and birth. Postpartum is when transitions between health professionals occur and the relationship with prior midwife is abruptly ended. This transition is often found difficult and can leave new mums reluctant to participate in information exchange, usually keeping personal information concealed from health professionals. Social media is frequently used throughout this period, new mums regularly join online communities where interaction with other likeminded mums can occur and information exchange between new mums can help to promote positive postpartum mental wellbeing. Support and advice from family and friends at this stage of motherhood is also important, when relationships with health professionals are no longer continuous or secure.

Here, sub themes are identified (see: Table 2) along each stage of the pregnancy/postpartum timeline, highlighting information needs, relationship with health professionals and technology use.

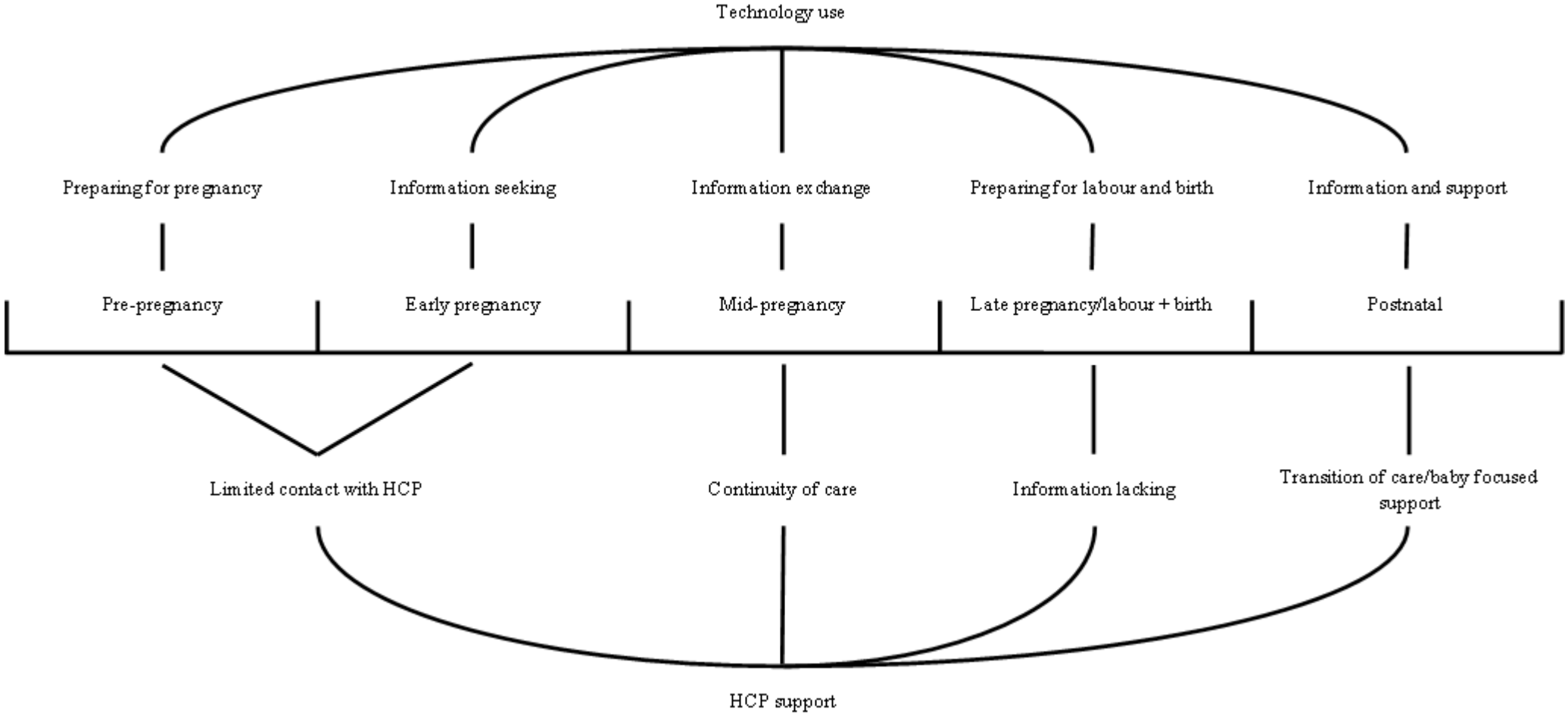


Figure 2. *Timeline of themes*

Table 2: *Themes identifying perinatal information needs*

Theme/Timeline	Sub theme
Pre/Early pregnancy	• Preparing for pregnancy • 'Baby as fruit'- technology use for information seeking
Mid pregnancy	• Continuity of health professional leads to information exchange • Technology used to facilitate midwife appointments • Social community online and offline to seek experiential information
Late pregnancy/ Labour+Birth	• Information lacking from health professionals in preparation for birth • Online and offline resources to prepare for labour
Postnatal	• Coping with transition of health professionals • Lack of HCP support increases use of on/offline information sources • Loss of personal information for new mothers

3.6.1. Pre/Early Pregnancy

3.6.1.1. Preparing for pregnancy

It was apparent that often information seeking, and technology use begins pre pregnancy and involves becoming more self-aware of fertility and tracking menstrual cycles. Apps and social media were the main technology domains used in this period, with women reporting that Pinterest, YouTube and Ovia app were most helpful in adjusting diet and exercise regimes and tracking ovulation each month:

"I did loads of searches on fertility, looks foods for fertility. I had a Pinterest board and stuff for fertility foods. I had fertility inducing exercises and stuff so I'd look at fertility yoga on YouTube." (P2, 3rd trimester)

"I had the OVIA app and that told you when you were ovulating." (P4, 2nd trimester)

3.6.1.2. 'Baby as fruit'- technology use for information seeking

Once women discover they are pregnant, their information needs become predominantly focused on the foetus, tracking the development week by week often by comparisons to fruit on apps and also what is to be expected in terms of pregnancy symptoms. Technology use at this stage of pregnancy is relied upon as professional midwifery care does not often commence until around 10 weeks gestation. Mobile apps appear to be of great importance in meeting the needs of the expectant mother and keeping her informed of foetal development and pregnancy progress:

"They are very visual, they are really easy to use. So the first thing that will pop up is a little picture of what size it is in fruit and then you can name your baby on it. Then it's just got different articles that pop up every day, so you can read them or not." (P2, 3rd trimester)

"I downloaded the OVIA app, that was the first app I downloaded... I like checking the daily, it's got a daily thing that pops up about what should be happening to your baby and what you should be feeling at that time and stuff. So I find that quite helpful." (P2, 3rd trimester)

"It's called Glow. I quite like it actually so it gives you a daily summary of what's going on, how things are developing and how you might be feeling. That kind of thing." (P4, 2nd trimester)

3.6.2. Mid pregnancy

As expectant mothers are introduced to their midwife or prenatal care provider the relationship begins to develop and this is where a pattern of information exchange is formed, therefore it is essential that this relationship remains consistent, and women are able to see the same health professional at each appointment. Women described continuity of health professionals as an important factor for information exchange, as they rely on their midwife to meet their information needs and regular meetings encourage the sharing of personal information.

3.6.2.1. Continuity of health professional leads to information exchange

One participant explained the importance of the midwife relationship being a first-time mum:

> *"Very important because you sort of build up a bit of a relationship with them and you need to feel confident that they know what they are doing. Especially as a first time mum you haven't got a clue what's normal and what's not so you need feel like whoever you're seeing knows what they are doing." (P7 4 months postpartum)*

Regularity of seeing a health professional with medical knowledge was important whilst also acknowledging personal information helps to build a positive relationship between expectant mum and midwife.

> *"I suppose it's because she sees you regularly, so it' the one person you see regularly that's a professional. And again I think it's just having the reassurance of having somebody that's in the field that you kind of what the OK from them." (P2 third trimester)*
>
> *"She remembered the baby's name and was asking about myself and stuff like that, so it's a bit more personal. But obviously everybody doesn't get that, but it would be nice if you did I think, had somebody throughout." (P2 third trimester)*

It was apparent that a good relationship needs to be built up before sharing personal information, those who were asked about their relationship with partner or spouse, were reluctant to share this information with their midwife:

> *"I don't think they are very sympathetic and they are quite abrupt in what they are doing. Then they asked me at my first 10 week appointment, they sent my partner out of the room and said (about partner) "are you scared of him, is he emotionally abusive?" and I thought you haven't built up a good enough rapport with me to ask that question." (P8 10 months postpartum)*

New mums also mentioned that due to appointments being too brief, for example due to time pressures of health professionals limiting the time spent with a patient, the sharing of personal information becomes difficult:

> *"It almost feels too brief a time you see each other to kind of talk very personally with them." (P10 1 month postpartum)*

3.6.2.2. Technology used to facilitate midwife appointments

It was noticeable that technology played a role in facilitating appointment time with midwives. Participants would often share information they'd found online with their midwife to seek their expert opinion or have the information verified:

> *"I think I check a couple of things with her, just said I've found out this information myself is this true? Because I feel like I need them to clarify it first." (P5 6 months postpartum)*
>
> *"Yeah that's when I asked about the strep B thing, when I'd looked a bit more online about it then I asked her about it. Because otherwise they would never mention it to you." (P7 4 months postpartum)*
>
> *"I think it's really useful as long as it's backed up. I think there is a lot of stuff out there that people are looking at and taking that advice and it's not necessarily proven or safe. So I think it's important to look where that source is coming from before you act on it." (P3 second trimester)*

However, technology also appeared useful as a standalone tool when there were lengthy gaps between appointments. Often expectant mums consulted online to find information when they did not have direct access to a health professional.

> *"I feel like there are things that I have looked up because I thought 'oh I don't know about this' so it would have been nice to see her a bit more often to check things." (P3 second trimester)*

Participants were asked if they would be willing to use an app to find and share information on that would be used by themselves and midwife and their response was positive, and it was suggested such an app could include a calendar for appointment recording:

> *"So yeah a calendar would be great, and even better if my husband could access it as well as he comes along to all of my appointments so I could share the information with him… but you know for those gaps in appointments. If there was a way of communicating or just checking in or something." (P4 second trimester)*

3.6.2.3. Social community online and offline to seek experiential information

Often, technology was also used to seek information when it was lacking from health professionals. Expectant mums appeared to pursue the experiential information of

other mums either by use of online forums or YouTube. It appeared that online social communities provide support between each other making information exchange with health professionals less likely:

> *"I didn't find the midwives very informative… I found more on the internet. Mumsnet, I was on Mumsnet constantly, you feel like they answer quite honestly, they go in depth about it, something you'd probably never talk about with the midwife." (P8 10 months postpartum)*
>
> *"YouTube you get a pretty good idea of how similar they are to you and your views on the world and stuff." (P1 third trimester)*

Additionally, expectant mums also relied on offline sources of information such as family or friends who've previously experienced pregnancy:

> *"I suppose apart from the stuff on the internet and in the blue folder, I do ask friends who've had baby's questions." (P4 second trimester)*
>
> *"So actually I had to contact a friend because she was pregnant recently. Even though in the front of my folder it says… it's got a list of four things… but looking at it I didn't know which one I should be ringing…. So I asked a friend who I should ring and they told me." (P2 third trimester)*

3.6.3. Late pregnancy/ Labour + Birth

3.6.3.1. Information lacking from health professionals in preparation for birth

Participants described a general lack of information provided by health professionals in preparation for labour and birth. Information provided at NHS provided antenatal classes did not help preparing expectant mothers for labour birth and postpartum:

> *"But again it was very skimmed over, we did a breastfeeding class and I came away and said to my mam 'I still don't know what to do, until I have the baby I don't feel like I'm going to know what to do'. And I didn't, I didn't have a clue, when I tried breastfeeding afterwards I thought 'this is nothing like what they explained in the class." (P8 10 months postpartum)*
>
> *We went to one, which was an NHS provided one and I found it really frustrating because it was a flipchart and was 'I'm going to tell you this piece of information and this and this' and it was my midwife and she's wonderful but it was very obvious." (P1 third trimester)*

With Sarah my placenta wouldn't come away so they had to give me an injection. And I tore quite badly with Sarah so they thought they were going to have to take me into surgery to stitch it up because they didn't know if the tear had gone through to my bowel. So I wasn't prepared for anything like that, I didn't know about the different degree tears you could get, I think you just learn that as it comes." (P9 12 months postpartum)

3.6.3.2. Online and offline resources to prepare for labour

Although midwife appointments become more frequent in the later stages of pregnancy, this seem to be an area where a gap information presented. During this time expectant mothers are likely to use a variety of online and offline sources to meet their information needs:

"I think looking on the internet that was what prepared me for what was about to happen. I got started off, even though I didn't know I was getting started off I had read everything about getting started off so when they were coming in and saying 'we are going to do this now' I thought oh I already know that, that's fine." (P8 10 months postpartum)

"So my preparation for labour came from stuff I've found myself, and people that I've spoken to. I've got a book on hypnobirthing and once I got pregnant and I had lots of people messaging saying 'have you looked into hypnobirthing? Someone I knew did it.', so I looked into all that myself." (P2 third trimester)

3.6.4. Postnatal

3.6.4.1. Coping with transition of health professionals

After giving birth, new mothers experience many new challenges, of which advice and support from health professionals is relied upon, however is evident that this is greatly deficient in the post-partum period. Participants who were postpartum described that the transition between health professionals and switching from stable and continuous care with one midwife during pregnancy to interrupted care with unknown midwives' and health visitors post birth, this can often lead to new mothers feeling vulnerable and unsupported.

"Yeah that was kind of the way it came across 'just ask your health visitor' but then you feel like you are waiting to see your health visitor do you know what

I mean? Especially your initial appointment. So yeah I suppose it is quite tricky, even if you got a bit of a handover like 'This is Emma, this is the baby we've been looking after' do you know what I mean?" (P9 12 months postpartum)

"Then obviously after you've had your baby your sort of very vulnerable and you know, there's lots of changes going on. So you need a nice health visitor so again you feel you can talk to, or is supporting you in whatever you're doing and keeping you right. Because it's quite a scary time really." (P7 4 months postpartum)

3.6.4.2. Lack of HCP support increases use of on/offline information sources

Due to a lack of health professional information in the post-birth period, new mothers often rely on other forms of support such as family members or online sources to cope with the challenges they face:

"That was with Sarah, she was fine in hospital then when we got her home she wouldn't latch and it was Stephen's cousin who told me I've got slightly inverted nipples so that could be why she's not latching properly." (P9 12 months postpartum)

It was evident that a gap in care and information sharing arose in the days following giving birth and a need for more information provided by health professionals was apparent:

"Whereas I think as a first-time mam you need that information, it puts your mind at rest and because nothing prepares you for what's about to happen. We brought him home and I put him in the living room and was like 'what do we do now?'. He looked tiny in everything, so nobody really prepares you." (P8 10 months postpartum)

When information is lacking from health professionals, other non-specialist experts may be contacted or followed on social media platforms to help new mothers cope with a new baby:

"I'm on Instagram and I follow a sleep lady and she goes through everything about sleeping. I was nervous at the beginning thinking oh god I he's a bad sleeper how on earth am I going to do it? And recently I have been looking at her to try and get him to self-settle."(P8 10 months postpartum)

3.6.4.3. Loss of personal information for new mothers

When midwifery care is signed over to the care of the health visitor, the pregnancy folder containing all mother's pregnancy related medical information is taken by the midwife, this is something participants described not being prepared for and elicited an emotional response:

> *"I was like 'oh do I not get to keep it?' because as much as I didn't understand what was in it, it would have been nice to look back on it. I think especially second time it would have been nice to compare the appointments and stuff with them. But no I didn't realise they took it off you, and I'm quite sentimental I like to keep stuff." (P9 12 months postpartum)*

New mothers demonstrated an attached to this information and a sense of ownership, which they would have liked for future reference for any subsequent pregnancies:

> *"The midwife on the last appointment was like 'right I'll just take this', she was like 'I'll give you all the loose stuff in case there's anything you need' and then she just took it and you were like… oh. And Mike was like I feel quite sad because that's been with us for the whole journey and she just took it." (P10 month postpartum)*
>
> *"So yeah it's just nice to have a look back on isn't it. If my sister in law hadn't mentioned it though I didn't know they took it off you I thought you got to keep it." (P8 10 months postpartum)*

3.7. Discussion

This study aimed to examine how information seeking and information exchange occurred throughout pregnancy and postpartum, addressing information needs at each stage and identifying gaps in professional care. The study also sought to explore how information needs being met by prenatal and postnatal health professionals can influence the relationship and establish an opportunity of information exchange between expectant and new mother and health professional. Finally, the study also intended to address the role of technology in the information seeking needs of pregnant and new mothers, how this could act a standalone information tool or encourage information exchange with health professionals. Results showed a pattern of information needs emerged throughout a timeline occurring from pre-pregnancy, pregnancy and postnatal. Sub themes were generated which explore how participants

responded to information needs being met or unmet throughout pregnancy and how technology helped to fill gaps where interactions with health professionals were limited, with mobile applications, internet searches and social media emerging as the most common forms of technology use among expectant and new mothers.

3.7.1. The role of technology to meet information needs

Findings of the study show the importance of technology use, ranging from pre pregnancy to postpartum it was apparent that women use technology to fill information gaps. Many women reported using mobile apps for information on baby development and pregnancy milestones. It was apparent that enjoyable features of the popular apps Ovia and Glow included visual appearance, user friendly navigation, snippets of information such as daily pop ups and likening baby to the size of a fruit each week of gestation. Mobile app use appeared the most common form of technology to gain this information during early pregnancy and provided women with easily extractable information. Planning for pregnancy using fertility related apps or social media, such as Ovia, YouTube and Pinterest were also popular amongst women, who described that tracking cycles, ovulation and following fertility diets helped them to prepare for pregnancy. In the early stages of pregnancy, it appears information needs are focused mainly on foetal development and pregnancy symptoms to expect. When contact with HCPs is minimal throughout the first trimester, technology equips expectant mothers with knowledge to meet these information needs however the sharing of such information seems limited.

As expectant mums' journey through mid-pregnancy, interactions with HCPs become more frequent, however gaps in care where also identified here. Women described the wait between appointments being too long and often would seek out information from technology sources to fill this gap. Although technology is approached with caution, mothers described online information may not be from trustworthy sources, it can be beneficial in other ways. Expectant mums regularly use technology to seek out experiential information of other mums, forums such as Mumsnet provide a platform for mothers to engage with each other and share personal information relating to pregnancy, birth and motherhood. Participants described when information from HCPs did not fulfil their needs, seeking experiential information helped to gain trustworthy information and share information that may not be exchanged with health professionals.

During late pregnancy and postpartum women felt generally unequipped with information from HCP and therefore used technology sources to meet their information needs surrounding labour, birth and postpartum challenges such as breastfeeding. Previous research also showed that postnatal information needs are often desired yet unmet by health professionals (Sink 2009, Henshaw et.al. 2018). Participants of the current study explained their preparation for labour came from online searching and although NHS antenatal classes were provided, often the information was basic and skimmed over and mothers felt this had not prepared them for the realities of labour and postpartum recovery.

Health professionals must be informed of this as pregnant women transitioning into motherhood are regularly left feeling vulnerable and unsupported, meeting these information needs could also have positive benefits to the health professional-patient relationship and it could help women to feel empowered entering labour and birth knowing all the possibilities to expect and having access to support in the recovery period.

3.7.2. Technology to support information exchange

Although technology is greatly advantageous for expectant and new mothers to fill information gaps, it can also provide the opportunity for information exchange between women and health professionals. Women explain that time between appointments is too long, technology appears to act an advantageous tool for information seeking where gaps are present. Information found online can be stored to present to midwives during appointment time and this can have the positive benefit of encouraging information exchange. As women develop into the later stages of pregnancy, continuity of health professionals can lead to good relationships forming and giving the opportunity for information exchange to occur. These findings adhere to Lagan, Sinclair and Kernohan (2011); however, the current findings also add that infrequency of antenatal appointments can provide a positive outcome as pregnant women using technological sources of information can use this to discuss with their prenatal health provider which can assist in building up a good relationship where information exchange can arise.

As women transition from pregnancy into motherhood, they are introduced to new health professionals and their relationship with their prenatal care provider ends. This transition leaves women feeling vulnerable and in need of professional support, however it is evident that support is lacking for postpartum mothers. New mothers use

online sources and family and friends to seek information and meet their needs, but this information is often not shared with health professionals. Women stated that information exchange occurs when they have built a trusting relationship with their health professional, therefore being introduced to new HCPs at a vulnerable stage leaves woman unlikely to share personal information.

Postpartum is also a time when pregnancy information is taken away, something which mothers are not warned about. This loss of information has an impact on mums who often feel emotional attachment and ownership over this information, which could result in a lack of trust with HCPs postpartum. Therefore, it would appear beneficial for pregnant women to be informed that this personal information will be returned to health professionals after giving birth.

3.7.3. Relationships with professional and non-professional network

As shown, relationships with health professionals are important for expectant and new mothers. Continuity of interactions with prenatal care providers have shown to encourage information exchange as women express likeliness to share personal information with their midwife when their relationship has had time to develop. Relationships with health visitors for postnatal mums appeared less secure as they have limited time to discuss personal information as visits tend to be baby centred. Health professionals need to be aware of this transition into postpartum where new mothers generally feel less supported and information needs are not fulfilled. Although technology has demonstrated a helpful tool to equip expectant and new mothers with information where gaps were present, often relationships with friends and family can provide support when needed. During pregnancy, women reported seeking the advice of friends and family with previous experience of pregnancy to provide information on topics such as preparing for labour, especially when this information was lacking from health professionals.

3.7.4. Strengths/ Limitations

A strength of this study was expanding on previous literature by examining technology use across pre pregnancy through to postpartum, as this had not yet been previously examined. Assessing the whole spectrum from conception to birth and beyond allowed the findings to highlight specific time periods throughout this timeline where information gaps were present. The use of mobile apps, social media and online resources aided in meeting the information needs of expectant and new mothers, if

information was not readily available via health professionals. The findings demonstrated that technology use throughout pregnancy and postpartum can promote information exchange and communication with health professionals and assisting in developing trusting relationships by empowering women with knowledge of what to expect throughout their personal journey of pregnancy to motherhood. The sample size included a good representation of perinatal women residing Northeast England and reflective of how information and support is currently provided to women in this region of the UK. All women were White British and in relationships, therefore this sample is not reflective of all types of mothers. To expand the results further it would be useful to investigate how perinatal women from various ethnicities experience information and support in this region and how single mothers navigate pregnancy and motherhood and what type of support is currently sought. Although the study addressed both pregnancy and postpartum, participants were at different stages of pregnancy and postpartum themselves so often had to rely on memory of earlier events to provide details of information seeking, exchange and technology use. A case study approach where participants could be followed in 'real time' would help a more accurate picture of information work to emerge.

3.8. Conclusion

This study discovered that the transition from pregnancy to postpartum is when women felt most vulnerable and identified an important gap in care where health professionals appear to not be providing the information and support required to meet the needs of a new mum. The findings encourage further investigation into the postpartum period and how new mothers can feel more supported and have visits from health professionals focused on mum as well as baby. Currently, new mothers use technology to fill information gaps and seek support from online and offline communities after giving birth, however providing women with a source to store personal information may help to encourage information exchange and build positives relationships with their postnatal health providers.

Chapter four aims to focus on the postnatal stage further by adopting a longitudinal 'case study' approach, where two new mothers will be followed from birth to six months postnatal and information work and support will be monitored to see where gaps are present and to explore possible solutions around improving information exchange.

Chapter 4: Study 2: A diary study of postnatal mothers' experiences of information and support following birth

4.1. Chapter 3 recap and study rationale

Study one highlighted the importance of the postnatal period for new mothers, as this is when they experience higher need for information and support yet appear to receive less than the antenatal phase. Information is often sought through online networks such as social media or internet searching, and little is offered through healthcare professionals (HCPs). Structured postnatal home visits often focus on baby's health as priority while less focus is given to the new mother. New mothers in the initial postnatal phase describe relying on family and friends as forms of support and only contact HCPs if medically necessary, especially in relation to their own health and wellbeing. The lack of support and information offered through HCPs in this phase can leave mothers feeling vulnerable, and often susceptible to relying on misinformation using internet sources. Therefore, a need for a focus on the postnatal phase is essential to make sure that new mothers are being provided with the care and support they require and are given reliable information in this phase following birth.

4.2. Introduction

The postnatal period has shown to be a vulnerable time for new mothers. Adapting to caring for an infant, recovering from birth, and less contact with HCPs than pregnancy can lead to feelings of psychological distress (Slomian et.al, 2017). The need for new mothers to be supported through the postnatal stage is apparent, with information being provided in the antenatal period of what to expect from postnatal care being greatly received by expectant mothers (McLeish et.al. 2020). If women are provided with information such as timing and content of postnatal care and what health professionals may be involved with this, including what to expect from their role, this could help to reduce feelings of psychological distress in relation to lack of HCP support in the postnatal phase, (McLeish et.al. 2020). In the postnatal phase, the structure of care extends to focusing equally on the mother and baby's health and wellbeing (nhs.uk) which is distinct from pregnancy where the focus of care is on the expectant mother and the unborn child as more of a single entity. However, the results of study one showed that new mums feel the balance of care received by health professionals in the postnatal stage is swayed more towards focusing on the infant and

less on the new mother. This flagged as an issue as often new mothers are left feeling less supported in the postnatal stage compared to during pregnancy.

The transition from pregnancy to motherhood often involves a switch in health professional care and postnatal visits from HCPs that were not introduced during pregnancy. Women often find this transition difficult as postnatal needs are not frequently met by HCPs, there also appears to be a lack of continuity of information provided during this stage following birth (Ollander et.al., 2019). Receiving continuous care and information in the postnatal stage can result in a positive experience when concerning health and wellbeing, however often mothers believe the information provided by postnatal midwives is not communicated with health visitors during the transition period which can lead to information exchange becoming a difficult process, with information being repeated and mothers feeling not listened to (Ollander et.al.2019). Currently in the UK, postnatal mothers receive after birth care from a midwife or health professional for up to 10 days following birth, with home visits generally being scheduled during days 1, 5 and 10, and a routine postnatal health check with a GP is usually scheduled between 6-8 weeks postnatal (NHS UK).

From a health professional perspective, it was found that the continuum of care following birth is often difficult as other factors such as high workload, communication difficulties with other health professionals, and transferring of care being on paper or in person all affect how postnatal care is given (Van Stenus et.al, 2020). This shows a need for improved communication between the services who deliver postnatal care to new mothers for good quality care to be provided and for new mothers to feel supported through this period.

4.2.1. Digital technologies for motherhood

In response to limited contact and support from HCPs in the postnatal period, new mothers often seek information and support via online services. However, in doing so, the risk of untrustworthy information is great therefore it is essential for new mothers to be provided with reliable forms of information when accessing online services. Slomian and Emonts (2017) found that if new mothers were to access a website offering reliable and trusted sources of information, categories such as breastfeeding, baby needs, baby blues and postpartum depression. This shows how many mothers experience mood changes following birth and have a great need to be supported through this stage.

Although the risk of receiving unreliable information is present, many new mothers often value the ease of accessing immediate information via the internet or keeping in touch with other mothers in online communities (Lupton, 2016). However, the need for professional advice and support was still highly sought by new mothers, along with easier access to information provided by HCPs (Lupton, 2016), showing a need for this to be addressed by the healthcare profession.

Internet forums can offer support to new mothers, especially for those experiencing postnatal depression (Moore & Ayers, 2017). Often mothers who display symptoms of postnatal depression feel a certain stigma around sharing this with HCPs, however gaining the support of other mothers via internet forums can help mothers to share their experiences more easily (Moore & Ayers, 2017). Internet forums also appear beneficial to pregnant women, who appear to seek advice from other expectant mothers on issues such as physical changes to expect throughout pregnancy (Ellis & Roberts, 2019). Sharing lived experience and having easy access to this information was desired among pregnant women above contacting HCPs, therefore in the postnatal stage it could be that women continue to gain information this way and not directly ask HCPs for advice unless medically necessary.

4.2.3. Diary studies

The use of diary studies has been apparent in relation to recording health symptoms and noting experiences of health conditions (Ayobe & Sonne et.al., 2018; Hong, Lakshmi et.al., 2020; Vega et.al, 2018). Ayobe & Sonne et.al (2018) found that 'bullet journaling', a process using analogue journals to write down past, present, and future goals, demonstrated that users engaged in mindful thinking through self-reflective practice; tracking mood allowed participants to improve their own emotional wellbeing and coping strategies. Paper based diary studies can assist patients to navigate their illness/condition and help to share experiences to build better patient-based care (Hong et.al., 2020). Participants with Parkinson disease using paper-based diaries demonstrated that this form of information storing made the participants more self-aware of their own symptoms, which assisted symptom management (Vega et.al, 2018).

This journaling practice could also be implemented for postnatal mothers who have displayed signs of increased stress and low mood following birth, reflecting on day-to-day life caring for an infant may help to also produce self-reflective strategies.

Expressive writing has shown to be beneficial to postnatal mothers suffering from postnatal depression, by reducing stress levels (Ayers et.al., 2018), women were asked to recall a stressful event surrounding birth or motherhood and to write a diary account documenting feelings related to this event. It was found that following 1 month post birth, completing the writing task had led to lower stress and depression levels, however by 6 months postnatal new mothers did not appear to have continued lowered stress and depression level (Ayers, et.al, 2018). This suggests that as contact with health professionals early postnatal is frequent this could produce positive for new mothers who rely on support and could use the writing task to communicate stressful birth and postnatal related events, however as this contact diminishes following the months after birth this appears to correlate with lower mood in new mothers highlighting the need for continued postnatal mental health care.

Journaling methods used for pregnant or postnatal adolescent mothers could also be a way for new mothers to express their thoughts and feelings following birth and help to reduce stress and the related anxiety of having a lack of postnatal mother focused care. Video diaries have shown to produce positive effects in breastfeeding mothers (Taylor et.al. 2019), centred on UK based new mothers and the difficulties they experience surrounding breastfeeding. Using a camcorder to capture the experiences of mothers breastfeeding journeys it was found that these video diaries produced a therapeutic and acted a 'confidante' or someone to speak to about the breastfeeding struggles the new mothers faced (Taylor et. al, 2019). New mothers participated in a video diary study where it was often discussed how they expected and relied upon advice from health professionals such as the health visitor regarding breastfeeding struggles (Leeming et.al.2015). Findings showed gaining support from health professionals regarding postnatal issues such as breastfeeding has shown to produce feelings of both empowerment and disempowerment based on the level of expertise knowledge and support that is given to new mothers from trained health professionals (Leeming et.al. 2015). This amplifies the need for new mothers to receive professional expert advice to feel empowered about their breastfeeding choices.

4.3. Rationale

4.3.1. Longitudinal study

This study aims to focus on the postnatal stage further by adopting a longitudinal 'case study' approach, where two first-time mothers will be followed from birth to six months postnatal. Previous research has focused on specific time point, often towards to the beginning of the postnatal stage following birth. Although this appears a crucial stage for new mothers as this is where mood changes are most likely, information needs are high and postnatal recovery is challenging, it has not been explored in the literature how information needs and mental wellbeing change over the first months following birth. Therefore, this study will adopt a longitudinal approach following new mothers up to six months postnatal to explore changing information needs, postnatal wellbeing and mood, and support and relationships with healthcare professionals.

4.3.2. Journaling method

As journaling methods have shown to be successful in increasing mental wellbeing, and encouraging mindful self-reflective practice, this study will implement a paper-based journal method covering the initial stages of postnatal to capture personal information about themselves and baby. This will be assessed to explore if the information stored in the journal could be used in more successful ways to improve information exchange between new mothers and HCPs. In addition, the journal is designed to act as a prompt and aide-memoire during the interviews.

4.3.3. Research Question

The following research questions were posed for this study to capture the general postnatal experience of new mothers and examining how a journal process may assist new mothers to capture personal generated data (PGD).

1. How do mothers experience information and support in the first six months postnatal?
2. To what extent can a 'new mum journal' encourage information curation and sharing with key stakeholders?

4.4. Method

4.4.1. Research Approach

A case study approach was taken for this study to allow expansion on the findings displayed in Study 1 (Chapter 3). A case study approach allowed an in-depth

exploration into the postnatal phase and ability to follow participants in 'real time' exploring their experiences of the postnatal phase as first-time new mothers. Based on the findings of Study 1 (Chapter 3) and the highlighting of the postnatal phase as an area in need of further investigation as to how new mothers are using resources to store and share information and a need for a deeper focus on mum, a journal was designed. Based on previous research and the positive outcomes of journaling methods for improving mental wellbeing, a 'New Mum Journal' was designed to give to participants to use in the firs twelve weeks post-birth. Semi-structured interviews were conducted, and the journal was used as a prompt to enhance discussion at each interview in the initial twelve weeks. The journal was designed to allow new mothers to record personal data about themselves or infant. Semi structured interviews were altered throughout the initial six months in motherhood to reflect the changing information needs and sources used during this time.

4.4.2. Journal Design

The design of the 'new mum journal' (Figure 3) was created to allow new mothers to focus and reflect on their own physical and mental wellbeing following birth, while also allocating time to record baby's progress in these initial stages. The design of the journal was based on taking key elements from currently available journals for pregnancy kept by the researcher, for example to 'Things to do' and 'How mum is feeling'. Other elements were adapted from apps discussed by participants in Study 1 that allowed bullet bointed or snippets of information to be written in the journal. The journal design was also based on the idea of expressive writing which has shown to be an effective form of improving mental wellbeing for new mothers, especially when struggling with postnatal mental health (Ayers et.al., 2018). The 'Notes' section of the journal allowed the mothers to write longer accounts of their weekly experiences to provide the option for expressive writing to occur. The journal was designed to appear bright and user friendly, with clear sections and weekly positive messages/milestones such as 'Congratulations' or reminders '6 week check-up due' as prompts to new mothers. Progress could be tracked over the initial twelve weeks postnatal and personal information stored in the journal could be kept as a record to present to HCPs should any concerns regarding mother and baby arise.

Figure 3: *New mum journal design*

4.4.3. Participants and Sampling

Two participants aged 29 and 36, were selected via purposive sampling as they fit the criteria of being an expectant mother in third trimester who could participate in a postnatal case study. Both participants took part in semi structured interviews during Study 1 (Chapter 3) and agreed to participate in follow-up interviews to document

their experiences of the postnatal phase as first-time mums and engage with the new mum journal for the initial twelve weeks following birth. As outlined in Study 1 (Chapter 3) both first-time mothers were based in Northeast England based.

Research has highlighted that a sample size of one is adequate for a case study design (Boddy, 2016) however for this study as two participants from Study 1 were in their third trimester at the time of interviewing, it was decided that both would be approached to take part in the case study to understand their postnatal experiences of information and support. As outlined in Study 1, both participants were based in Northeast England, this study allowed further insight to the current postnatal care currently provided in this region of the UK. Both participants were interviewed at months 1,2,3,4, and 6 postnatal to discuss both their thoughts on the new mum journal and what information and support were sought and received during the initial 6 months on motherhood.

4.4.4. Materials and Procedure

Interviews with both new mothers took part at a place of the participants choice, which included a public setting or private home. Prior to interview commencing, both participants were provided with consent and participant information forms, along with copies of the 'New mum journal' (Figure 3) given at 2 weeks postnatal. Participants were asked to fill in weekly accounts of the journal providing as much detail as possible in each section and using the notes pages for overflow. If no new apps were used in a particular week, they were instructed to leave this section blank. Participants were asked to bring the journal along to the monthly interviews between months one to three and the journal would be used as a prompt to accompany the interview so participants could discuss further what they had written in the journal.

Participants were required to attend monthly interviews (example interview schedule in Appendix 5) from months one to six postnatal. A semi structured interview schedule was devised to have two main sections of questions, the first relating to the 'new mum journal' and included questions such as 'What do you think the benefits of using the mum journal as a paper copy?' And 'Would you prefer/use a digital version?'; the second phase of the interview was structured around postnatal information seeking behaviours and included questions such as 'Since giving birth, what have you most wanted to find out about baby and yourself?' and 'Who or what have you relied on most to provide this information?'. Other topics included in the interview schedule

were focused on the eRedBook (electronic digital child health record book), returning maternity notes after birth, postnatal care received and focus on mother or baby, benefits/disadvantages of a digitising the new mum journal and relationship and support with HCPs postnatal. Questions were adapted to suit each month of the postnatal phase and month 6 included reflective questions on the first six months of motherhood.

Interviews were recorded using a Dictaphone and lasted approx. 40 minutes to 1hour each. Upon completion of the interviews at 3 months postnatal, both journals were copied for the researchers records and participants were invited to keep the journals for personal record. Participants were also issued with debrief forms upon completion of case studies at six months postnatal.

4.4.5. Data Analysis

Interview transcripts were analysed using Template Analysis (King & Brooks, 2016). Template analysis was chosen to analyse the data from the case study interviews as this study was an extension of study 1 (Chapter 3) therefore it was expected that some themes found in study 1 would overlap to study 2 (current chapter). It was anticipated that the themes specifically relating to the postnatal phase in the previous study would be expanded here. Template analysis allows a coding framework ('Template') to be developed based on anticipated themes and coding can either be placed into these themes or new theme can be created. The procedure for the template analysis in this study was firstly to create a framework of expected themes (as shown in Appendix 6), followed by coding the initial two transcripts to assess where the codes 'fit' into the themes. Codes were initially developed by the researcher and discussed with the supervision team to ensure reliability. The remainder of the transcripts were coded into the framework and any new codes/potential themes were noted below the table (Appendix 6). Once coding was complete, themes were created to reflect the experiences of both new mothers across the first six months postnatal.

4.4.6. Ethical considerations

Ethical approval for this study was granted by Northumbria University Ethics Committee and ethical consideration was given throughout the course of data collection, informed consent to record and transcribe participant data was given prior to the interview commencing.

4.5. Findings

Findings of the case study showed that both postnatal mothers who participated had defined methods of seeking, storing, and sharing information. Information seeking included extracting data from external sources such as the internet, social media, healthcare professionals (HCPs) and family and friends. Recording and storing of this extracted information was less apparent and it appeared that the new mothers used their 'new mum journals' to record and store personal generated data (PGD), which included information related to baby sleep, daily activities, mums' thoughts and feelings and highs and lows of the week.

Capturing PGD in the form of journal writing had benefits for both new mothers and as it not only encouraged self-reflection, especially when dealings with bouts of postnatal low mood and anxiety, it also acted as a useful tool to encourage better communication with HCPs. For example, noting times, dates and information regarding health of baby and mother assisted in obtaining specific information and from online forums/websites or asking particular questions to HCPs during home or clinic visits to ensure a more tailored information understanding.

Findings from the interviews spanning 1 month postnatal through to 6 months postnatal showed that new mothers' patterns of information needs change throughout this period and relationships with HCPs can vary in response to help and support offered. The journaling process assisted with encouraging information exchange between mother and HCP, however implications of the structure of home visits early postnatal and the continuity of care from HCP was also flagged as a potential issue of this period following birth. As mothers were keen to use technology sources to extract information to meet their postnatal needs, it was discussed with them whether a digital version of the new mum journal would be a useful platform not only for recording and storing PGD but also keeping a record of information found from online or HCP sources. Many potential advantages of a digital new mum journal were considered from the mother's perspective. Ideas for future technology sources that could support postnatal mothers and improve communication with HCPs was noted as well as what possible barriers to this type of technological communication tool may entail.

From the template analysis of the interviews, 3 overarching themes and related sub-themes are discussed (Table 3)

Table 3: *Overarching themes and sub-themes reflecting findings of thematic analysis*

Theme	Subtheme
Postnatal information seeking	• Internet/app use for information extraction • Seeking advice direct from HCPs • Improving communication with HCPs • Using social media to seek advice from other mothers
Curating and sharing personal generated data (PGD)	• Writing journaling process encourages self -reflection • Sharing personal information with HCPs vs Family and friends • Caution sharing personal generated data on social media
Digital platforms to record and share PGD	• Benefits of a digital 'mum journal' • Recording PGD in a digital Child health record book (Red Book) • Easily accessible information • Barriers to self-recording PGD digitally

4.5.1. Theme 1

4.5.1.1. Postnatal Information seeking

It was apparent that information needs early postnatal were often met by searching on the internet or using technology such as mobile apps to extract online information. Both new mothers explained that seeking and extracting information was important

for postnatal mothers to meet additional information needs whether focused on mum or baby.

4.5.1.2. Sub theme 1- Internet/App use for information extraction

Postnatal recovery from birth was the most sought information need and both participants described internet use and 'Google searches' useful for providing information about both physical and mental expectations of postnatal recover, for example asking 'is this normal' to be feeling very emotional after giving birth.

> *'I feel like sometimes I've googled things which I probably shouldn't have, so for me when I was feeling emotional I was like is this normal?' Participant 2*

> *'Probably just google for general things. There's not anything specific that I've used but mainly the internet if I'm looking for stuff' Participant 1*

> *'One day because I was feeling low and kept crying and I thought oh god have I got postnatal depression so I googled it' Participant 1*

When information appeared lacking from HCPs, especially related to postnatal recovery or 'mum focused information' participants tended to look at the internet to meet their information needs.

> *'I don't think I got anything on caring for my stitches or caring for the bleeding or even like signs to look out for baby blues, and what to do but nothing so you just sit and look on the internet for it all.'- Participant 1*

It appeared that once the new mothers felt they had recovered from birth their information needs were more focused on baby, this is when mobile apps such as 'Wonder Weeks', 'Baby Centre' become useful for gaining valuable information on what to expect in baby development from birth to 6 months. The Wonder Weeks described baby development in terms of 'leaps' and what behaviour baby may display following each week after birth. Baby Centre seems to offer similar information giving weekly updates of baby milestones and development to expect following birth.

> *'The wonder weeks is really good I've only had that for a week or two….it tells you what's happening during that week so that's really good. She's going through a leap at this moment so everything it says about like she might be a bit more clingy, or her digestive system is sorting itself out' Participant 1*

'I downloaded an app on my phone called Babycentre and I had it throughout pregnancy…it continues to track what happens each week. So it said week 7 your baby will cry a lot so that kind of reassures me when she was crying a lot I thought actually it says on there so all is good' Participant 2

4.5.1.3. Sub theme 2- Seeking information direct from HCPs

Although extracting information from online sources seemed the first avenue of fulfilling postnatal information needs, both new mothers also described seeking information direct from HCPs to provide more help and advice, specifically on issues surrounding breastfeeding and bleeding after giving birth. Often the support and information provided from HCPs was minimal, however Participant 1 mentioned having access to a student midwife who was available via text, which appeared to be a very useful information resource for the new mother.

'In terms of recovery stuff, I text the student midwife loads, so that's who I would speak to, so when it was like about my bleeding or if it was anything about, like even changing the bottle teats up' Participant 1

'Yeah the health visitor and the midwives, so both when they visited... But it wasn't that helpful, and also breastfeeding support never got in touch and I was told twice that they would get in touch with me and that my number had been passed on' Participant 1

There was a reluctance to seek advice from HCPs unless it was medically urgent and could not wait until a next scheduled appointment. Mothers were more likely to get advice from internet sources or family and friends before consulting a health professional.

'if it's something I felt that wasn't urgent I would probably wait and speak to the health visitor… so I felt like I could ask her or wait a couple of days and ask her. Then if it was something a bit more urgent I'd go straight to the GP.' Participant 2

The relationship with HCPs and support offered would often impact on the new mothers' sharing personal information with them, especially around postnatal mental health. HCPs were considered a last resort to seek advice from for support concerning the mother.

'I think I'd be likely to ask other people because I think I'd feel like the health visitor was judging. I think I'd like she'd be 'ugh is she struggling, is she this is she that' and I think I don't know. I've got on with my health visitor so maybe I would, I think maybe I'd just be more likely to ask other people first then her if it got to a point where I was really struggling.'- Participant 2

The availability of HCPs also affected how information would be shared with them, if HCPs were not available then participants would likely seek advice from family and friends which would often include sharing personal information. However, if support is offered from HCPs then information sharing and seeking advice came more readily to the new mothers, though sharing most personal information tends to be kept to family and friends.

'Breastfeeding support never got in touch and I was told twice that they would get in touch with me and that my number had been passed on. But they never did get in touch so I was waiting for them to get in touch with me but they didn't, so then I tended to just ask friends for advice'- Participant 1

'The health visitor has been really useful, she has give loads of good information. And she's been really real with stuff rather than saying like jazzing it up a bit, she has been really honest with stuff. But yeah I think mainly friends you can feel a bit more relaxed asking silly questions.'- Participant 2

4.5.1.4. Sub theme 3- Improving communication with HCPs

An issue raised was the waiting time to speak to HCPs therefore it was suggested that a communication technology device that could be shared with HCPs to provide quicker answers to challenges raised would help mothers feel more at ease. Accessing HCPs via a video link instead of clinic appointments would also be beneficial as Participant 2 described the need to 'see somebody' rather than information being provided via online communication

'I think the thing was the waiting, so being able to speak to somebody straight away would be good, but maybe via a video link ,I feel like I'd need to see somebody'- Participant 2

When asked about future technology design to assist new mothers, a robotics/digital device that could arrange appointments with HCPs or set reminders was suggested.

Participant one described that seeking advice directly from HCPs or booking appointments via an online system would help to reduce stress of accessing HCPs.

> *'Yeah because maybe mammy sue (Robot name) would put you in touch with the health professionals when she feels like that's what she needs. She'd be like 'ok this is too much for me so let's speak to health professional'.. yeah maybe she'd book appointments for you that would be good.'- Participant 1*

Ease of accessing health professionals was viewed as important to be able to seek advice/share information, future technology ideas which addressed this and made the process of gaining access to a health professional was viewed as important by the participants.

4.5.1.5. Sub Theme 4- Using social media to seek advice from other mothers

Both participants described asking mainly friends and family for motherhood related advice, however the new mothers also discussed using social media to gain advice from other mothers, which included the use of Instagram to search for 'celebrity mums' or using messenger services such as WhatsApp or Facebook messenger to stay in touch with new mums met at baby classes.

> *'celebrity mams and stuff like that… random mam bloggers and stuff like that. Or maybe like small businesses that make baby things, I've followed a couple of them recently. You know that make teething necklaces and other little things like that'- Participant 1*

> *'Facebook messenger, yeah actually I don't think we swapped numbers I think it was just on there, then one of the mams tagged me and another mam in a messenger group. So yeah we've just kept in touch in that group.'- Participant 2*

Generally, it seemed the new mothers used technology platforms to seek and extract information to meet postnatal needs, with social media, mobile apps and google searching all appearing to be popular avenues to gain information related to postnatal recovery and baby development. Social media was also used to keep in touch with other mothers and share advice. Seeking advice direct from health professionals seemed the less preferred method of extracting information, with new mothers only using this source when medically urgent.

4.5.2. Theme 2

4.5.2.1. Curating and sharing personal generated data (PGD)

Both participants of the case study were given a 'new mum journal' to fill in which spanned the first 12 weeks postnatal. This was a way of mothers being able to record personal information that could be accessed at any time and potentially act as a communication tool for discussing with HCPs. It became apparent that mothers are more likely to store personal generated data (PGD) rather than data extracted from other sources. The journal had benefits to both mothers, allowing a time to focus on self-reflection, especially when suffering from postnatal anxiety/low mood. The information stored in the journal was shared mostly with close family members and friends, but it was mentioned that it could provide useful talking points to share with HCPS particularly when seeking advice about medical issues related to both mother and baby.

4.5.2.2. Sub theme 1- Writing journaling process encourages self-reflection

The writing process of a weekly journal entry was described as a 'cathartic' process, allowing mother to participate in some time for herself while baby may be sleeping. For Participant 1 who described a struggle with postnatal anxiety and bouts of low mood, writing in the journal allowed reflection on the previous week and perspective on positive aspects of the week, resulting in less feelings of negativity.

> *'It's really easy to use and it's quite nice to reflect on your week to see what you've done, what your feelings are, er.. but I find it quite cathartic…. I find the process of actually writing is relaxing, probably more relaxing than just sitting on your phone because you sit on your phone all the time. - Participant 1*

> *'But its quite nice just to see mentally how you are up and down and thinking oh that was a hard week but I got through it and this has been a nice week. But it has been nice storing them things about me… So say if you've had a few bad days but then you go right well overall this week.. you tend to go oh actually it's been a nice week. So it's not focusing too much on the down points if you were doing it every day.' – Participant 1*

Participant 2 also described positive aspects of the paper-based journal and a self-reflection element which allowed her to look back over the previous weeks and

remember activities with baby or visits with friends, eliciting a positive response to the writing process.

> *'I feel like it's good to just record what you've been doing for the week and it's nice to look back because I feel like I've forgotten things already and then looking back over the things that we've done or people that we've seen….So I've actually enjoyed writing it all down.'- Participant 2*

Both participants enjoyed having a journal to record personal data and have as a record of the first weeks after giving birth for future reference. The journal also became a way to keep a focus on both mother and baby and have this information stored together. Looking back at the journal allowed mothers to have a document of their progress in dealing with the challenges of motherhood.

> *'I like that it is about Rosie and that it's also about me. Like I said I feel like I've forgotten how I felt at the beginning to how I feel now like how sore I was and even like emotional… even looking back at that to think actually I've come so far from that first week.'- Participant 2*

> *'Yeah I think it's quite useful to have baby and mam stuff together. So say if it was all.. like it comes hand in hand I suppose...yeah I suppose it tends to be about us both but it is useful having stuff for me as well because that's quite therapeutic I think' – Participant 1*

This could be an important aspect for new mothers to help to cope and process hormonal changes and fluctuating mood in the postnatal phase.

4.5.2.3. Sub theme 2- Sharing personal information with HCPs vs family and friends

Participants described that the personal information stored in the new mum journal would happily be shared with close friends and family along with HCPs. In the first weeks following birth, participants described willingness to share personal information with HCPs from the journal when it related to physical postnatal recovery, however other personal information particularly around postnatal mood changes would often be kept private from HCPs and information shared would often be baby focused.

'Probably baby, but I think … definitely the first week I felt it was me, because I felt she was quite easy … Then a lot of it was about me so I felt like a lot of the medical advice I sought from the midwife and stuff was about my recovery and what I need to do'- Participant 1

'Family and close friends, even health professionals as well to get information and ask questions'- Participant 2

Having information stored in the journal meant a record could be accessed of when baby started to develop any issues stated by mother. This information would be readily available to share with HCPs.

'Early stages because it might have been when I was talking about, because I think I had a few things about wind and her tummy and I think I had recorded things in so then I'd be like she's had bad wind for, oh right I'll have a look and this is where she starting having issues or whatever. Like stuff like that, so I could relate back to things and look at the specific weeks'- Participant 1

Participant one responded that sharing the information stored in the journal with husband helps to discuss issues around postnatal struggles…

'*Especially with my health and stuff because this week was quite hard with her being really colicky and crying loads and every day he's came in and I've been crying and he'll go 'do you need to speak to somebody?''- Participant 1*

The new mother also described sharing the information with close family but being more 'closed off' about sharing personal information with HCPs…

'Yeah, I'd probably let my mam see it, I haven't with health professionals…. I'm probably quite closed off with health professionals, I think. Yeah I think I sort of like I'll come to you when I've got a problem, I'm not like.. I'd rather speak to other people about it.' – Participant 1

Participant 2 described not having shared information from the journal with husband but would be willing to share information if she was dealing with any postnatal struggles

'Yeah totally I'd be totally fine for him to have a look for it but I've never once thought about it to be honest. But there's nothing that he doesn't know that's

in there, everything I've written about he's aware of. And if I wasn't feeling great I would tell him.'- Participant 2

4.5.3.4. Sub theme 3- Caution sharing personal generated data on social media

Sharing personal information recorded in the journal on social media or online platforms elicited a more cautious response from participants, stating issues around privacy would affect how much information was shared online. Personal information was described by both participants as being more likely to be shared on private social media messaging services such as WhatsApp rather than public platforms such as Facebook.

'I don't to be honest, just pictures of the pram and there's pictures of the back of her head but I don't put pictures of her. I just share them on WhatsApp with friends and family….Private yeah, then you know it's just friends and family. Rather than friends you don't really speak to seeing her.'- Participant 2

'If she wasn't feeling well I'd maybe put something up asking for advice maybe, or asking about baby groups say, I'd maybe put that up saying what are local baby groups. Stuff that I've written down- in chats I would probably share it with some people but not as a Facebook status…like say if I'd downloaded an app I'd share that. I'd share in chats or WhatsApp and stuff'- Participant 1

Overall, it appeared that the new mothers were willing to produce and store PGD in the journal form and described a therapeutic writing process which encouraged self-reflection, however when it came to sharing this information both mothers were more cautious about who would be able to see the information. It appeared that close family and friends were most likely to see the information and offer support, and this support was mostly sought from new mothers through partners or immediate friends and family. Both mothers discussed receiving support from their partners and a willingness to share information included in the journal with them. However more caution was taken when sharing the information in a more public setting for example via social media or HCPs. This was especially apparent when the information related to personal issues experienced in postnatal recovery and motherhood.

4.5.3. Theme 3

4.5.3.1. Digital platforms to record and share PGD

Although both new mothers described enjoying the paper based new mum journal to record PGD in the first weeks following birth, it was also discussed whether a digital version of this journal would be more beneficial. Both mothers noted it was more difficult to find the time to sit with the paper-based version to record their personal data as their baby became more awake during the daytime.

4.5.3.2. Sub theme 1- Benefits of a digital 'New Mum Journal'

Further benefits to a digital new mum journal included ease of access, if it were a mobile app access to a phone would be easier than having to find the paper-based journal. This was suggested by participant one as when baby was sleeping on mother, having a phone in reaching distance meant that recording PGD could be done while sitting with baby.

> *'So even when she's on me and I'll go oh I need to write in the diary, it will be in my changing bag which will be at the other end of the room and I've just sat down and have to pick her up and go and get it.. so at this time it would be easier to have it in the phone.'- Participant 1*

Participant one also described that a digital journal could provide an editing feature so the recording of personal data about mum and baby could be easily done throughout the week rather than as one full page at the end of the week and reflecting on the previous week. This would make it useful to add small details throughout each week which may be otherwise forgotten.

> *'But I suppose you could go back an edit it if you had a digital version and I suppose you could add things as you went along. So I'll do it at the end of the week and try and reflect on my week but if you had a digital version you could just add something quickly.'- Participant 1*

Additional features that a digital mum journal could include were also suggested by both participants; recording baby milestones, space to upload photos and a 'reminders' section which could be set as a pop for events such as registering baby's birth or booking in essential appointments. These additional features that a paper version could not provide would making recording PGD more efficient and provide quick access if this information were to be shared.

'But there they could have a space which said 'photos from this week' then you could upload all of your photos from that week which would be nice, and the stuff that says what we did then you could upload the photos of what you did… there could be little reminders that pop up say like 'have you registered the birth' or 'have you booked your baby in for the 6 week check'. It could be general things that help you remember and think oh no I haven't don't that, or 'have you signed up to a local group' it could be things like that for 'things to do'.'- Participant 1

'I think it would be nice to have a little reminder, like if a notification flashed up and said something on your phone and then you'd think oh ok I'll put something in I haven't written in today. So maybe little reminders or a little question like 'what have you done today?' – Participant 2

'it would be nice to have a little milestone section and put little things on that you could maybe quickly access, oh when was it when she -I don't know, slept through the night? Then you could quickly access it and it would show that date.'- Participant 2

4.5.3.3. Sub theme 2- Recording PGD in a digital Child health record book (eRedBook)

As well as the journal, the new mothers were also asked about recording the information in their child health record book ('red book') in a digital format. Storing mother and baby information together seemed to encourage further recording of PGD related solely to mother.

'I wouldn't go on a thing for just me and start writing about me but I'd go on something for her and if I was already in the online thing or already in the app writing about her then I'd be like oh ill quickly write my stuff in as well. But I probably wouldn't sit and write about me and click on an app just about me but if it was merged then you are more likely to write about yourself.'- Participant 1

A digital 'red book' would also provide mothers quick access to search categories, for example if they wanted to access their child's weight and height chart it could be done so in a clear highlighted tab on a digital version of the red book such as a mobile app.

This could also be useful for presenting information to share with HCPs at appointments.

> *'loads of information in it, but I feel like it's just not laid out very well. So if you just want to search for something it hasn't got an index or anything whereas online you could just search and find out what you were looking for. Sometimes I even struggle to find where her weight chart is in that, I am flicking through going where the hell is it again?'- Participant 1*

Participant 2 mentioned that storing mum and baby information together, not necessarily separate digital versions for both the journal and red book, would be easy to access and useful to have information stored in one place. However, this did raise some concerns about privacy and who would have access to personal information, especially if written in a diary format.

> *'Yeah, I think everything combined would be easier rather than lots of separate little things, I think you'd be much more likely to use it….But then I'd think, I'd want to know how much of it they could see via there computer and if I was writing loads of personal- more like a diary entry kid of thing, then I'd be thinking they don't need to see that.., but I'd be fine if they could access it as long as it was just certain key information that they would need to know.'- Participant 2*

4.5.3.4. Sub theme 3 – Easily accessible information

At six month postnatal, both participants were asked to reflect on the first six months of motherhood and their thoughts about future technology devices that would help to assist in dealing with the challenges of early motherhood. The new mothers were keen on the idea of a technology-based system that would provide easily and quickly accessible information, help new mothers, for example appointment reminders, and improving communication with HCPs; through having easier access to them or being provided knowledge that would improve the standard of care received.

Participant one stated one of the main issues faced as a new mother was timekeeping and dealing with illness, when asked how technology could help with this they replied that a device to provide immediate answers to daily issues that don't require medical attention would be helpful.

'I just feel like I want answers right there and then, but I feel like I want answers off a person right there and then. I don't want to just find the answer off the internet, I need to have somebody to literally answer it straight away and then go ah right ok that's the thing'- Participant 1

'So I feel like something- rather than asking 300 people, just a robot that would answer your question properly and be like 'yes this is what you should do'. Like a mam robot. '- Participant 1

Participant 2 similarly suggested that something to help 'put your mind at rest' would be beneficial and for information to be filtered rather than overwhelming information resulting from Google searches. Speaking directly to HCPs was important to help ease worries faced.

'*I think it's just something to put your mind at rest, I think sometimes technology can make it worse when you do Google stuff and they obviously have extreme cases on there and you just think oh my god. Then I think it is just speaking to the health professionals to put your mind at rest.'- Participant 2*

4.5.3.5. Sub Theme 4- Barriers to self-recording PGD digitally

Although both mothers reported beneficial aspects of a digital new mum journal there were a few potential negative aspects of having PGD stored digitally including privacy and security of who could access the information in an online format.

'I think it would be a trust issue of is the technology going to keep my information safe. I think that would be the only issue that I would have. Especially if you were putting photos onto an app…So yeah that would be my only thing I'd have to make sure it was really safe to store information.'- Participant 2

Recording PGD in a digital format seemed to produce more potential positive aspects to barriers, both new mothers seemed to be willing to record and store additional information in an online digital journal and this could have possible benefits to encouraging mothers to recording their own personal information as well as baby related information. Both which could help when communicating this information to HCPs or sharing it with friends and family. Privacy issues were raised about digitally

storing PGD and concern around who would have access to all information in the digital version of a journal and red book. Security settings would need to be reliable for new mothers to feel comfortable sharing personal information in a digital format.

4.6. Discussion

This study aimed to answer the following research questions:

1. How do mothers experience information and support in the first six months postnatal?
2. To what extent can a 'new mum journal' encourage information curation and sharing with key stakeholders?

To examine how new mothers experience information and support in the first six months postnatal a diary design was used to allow new mothers to capture personal generated data during the first twelve weeks postnatal and assess how this tool could be used to curate and share information. The diary or journal was useful in provided a focussed prompt at each of the interviews. Supporting the first research question, findings showed that new mothers use a variety of approaches to seek information and support in the first six months postnatal, most of which implemented technological resources such as the internet and social media and highlighted more of a reluctance to seek such information direct from HCPs. The second research question was understood through new mother's stating how storing personal data in the 'new mum journal' could make it easier to share information with HCPs, however this was discussed in relation to physical information (e.g. recovery from birth) rather than emotional (postnatal mood changes). The journal acts as a promising first step to help to build more positive and supportive relationships between new mothers and HCPs acting as a useful to allow information exchange.

4.6.1. Self-reflection through journaling: baby versus mum

Results of the case study following two new mothers in the initial six-month postnatal period showed that new mothers enjoyed the aspects of journaling which encouraged self-reflection, made it easier to share this information with health professionals, and enabled advice to be sought from health professionals more proactively. In line with previous research, expressive writing can produce encouraging outcomes for postnatal mothers even when dealing with the challenging aspect of new motherhood such as breastfeeding, lack of sleep and worries regarding health of baby (Crawley, et.al,

2018). Participating in an expressive writing task allowed new mothers to reflect on challenges faced resulting in new perspectives gained on the event allowing new mothers to 'order their thoughts' or 'gain clarity' on the difficulties faced associated with caring for a newborn, which often leads to reduced feelings of stress (Crawley et.al, 2018. Ayers et.al, 2018). A 'cathartic' process was highlighted in the current study, the participants who completed the new mum journal discussed this process being cathartic and allowing for self-reflection in a way which produced lower negative or anxious feelings.

Findings support previous work which showed how journaling could encourage self-reflective practice and improve wellbeing. (Ayobe and Sonne, 2018). This could be an important aspect for new mothers to help to cope and process hormonal changes and fluctuating mood in the postnatal phase. The benefits of the new mum journal allowed the first-time mothers to record both information about themselves and their personal challenges and daily accounts of their experiences as a mother whilst also allowing information to be stored about their baby. As highlighted in study one, and through previous research (Slomian et.al, 2017) where mothers felt that postnatal professional care is more baby centred rather than mother centred, the new mum journal allowed some self-reflection time for both new mothers to record PGD in a way that reflected their own motherhood experiences, both participants mentioned the positive result of having 'me time' to write in the journal.

4.6.2. Sharing personal information with HCPs versus others

As well as a useful tool for self-reflection, it appeared the new mum journal could also act as a prompt for sharing personal information with HCPs. However, participant discussed a willingness to share information relating to physical recovery with HCPs rather than emotional changes following birth, they were more likely to share information related to emotional changes with friends and family. The specific platforms to how mothers shared personal information with others included private messaging services such as WhatsApp or Facebook Messenger, and face to face sharing of information. Mothers expressed caution when it came to sharing information personal to both them and baby via social media. It was clear that the new mothers felt more comfortable sharing this information only with those close to them such as parents, close friends, and spouses.

Both new mothers appeared willing to share information with HCPs from the journal when it related to baby, for example changes in baby's health (having a physical record of information was described as useful to provide to HCPs during consultations) and were more 'closed off' to sharing more personal information. Due to a lack of continuity of health professional care following birth (Ollander et.al, 2019) this could make it difficult for new mothers to build up relationships with HCPs to allow sharing of personal information, as shown in the results of study one where relationships built through continuity of midwifery care during pregnancy resulted in increased likelihood of information sharing with HCPs. The new mum journal acts as a first step towards bridging this gap and a useful prompt to encourage new mothers to be more insightful of their personal challenges with HCPs.

4.6.3. Ease of use and functionality of digital format (eRedBook and new mum journal)

When asked about the aspects of a digital format of both the eRedBook and the new mum journal that may encourage use, in line with previous research (Lupton, 2016) both mothers responded that ease of accessing information would be a top priority along with a functional system to clearly pinpoint categories of the digital book. Currently the paper version of the eRedBook was deemed as not user friendly, however a digital version may help to combat this. In a wider context, O'Connor et.al (2016) found that when health professionals recruited parents to use the eRedBook some challenges arose including complexity registering for the online set up and privacy and security issues. From a health professional perspective, the extra workload of running an eRedBook and paper-based version simultaneously was discouraging for health professionals (O'Connor et.al., 2016). Further challenges to engaging parents in the eRedBook included lack of access to mobile technology or broadband services especially in deprived areas of the UK (O'Connor et.al, 2015). In the current study, both participants spoke constructively about combining the eRedBook with the new mum journal in a digital format so there would be a space to record PGD for both mum and baby in one application. Although some privacy concerns did arise, the general feedback for functionality of the design included appointment reminders, quick access to information and access to health professionals. This could warrant further investigation into specific functionality features for a proposed combined digital eRedBook and new mum journal.

4.6.4. Privacy issues around sharing PGD digitally

Although both mothers spoke positively about future digital sources of information storing such as a mobile app version of the new mum journal, favouring the accessibility, possible new features such as image storing and reminders/appointments section, they were cautious about the potential privacy and security issues that may arise by storing personal data in an online capacity. The main concern for new mothers surrounded who would have access to their personal data stored in this online format. Privacy and security issues relating to storing of personal data are widespread, and for mobile app use (Zhou et.al, 2019; Fife & Orjuela, 2012). If the new mum journal were to be digitised several security and privacy issues could be enforced such as user authentication (Zhou et.al, 2019) which could encompass fingerprint detection and a clear user privacy policy (Zhou et.al., 2019). Despite being viewed favourably by participants, the design implications of future mobile apps to store personal generated data must consider the potential barriers to security and privacy and implement specific features to improve the safety of use (Bhuyan et.al.,2017).

4.6.5. Strengths/Limitations

This study allowed for deeper examination of the findings present in study one which addressed a timeline of information seeking for pregnant and new mothers and addressed a need for further study into the postnatal stage to capture new mothers' information needs and relationship and support gained from health professionals during the early stages of motherhood. By implementing a journal approach this allowed new mothers to capture their PGD around the issues and struggled faced in the early days of motherhood. The longitudinal aspect of this study allowed the examination of how the information needs and technology use of new mothers develops within the first six month of motherhood, capturing how relationships with health professionals change within this time frame.

Addressing the limitations of the study, it was apparent from the interviews that both first time mothers would have liked to continue with the journal past three months, as the journal was designed to last the initial twelve weeks postnatal this meant that any self-reflective writing was not captured beyond this point. The journal was designed to cover the initial twelve weeks as it was unclear as to how the participants would engage with the tool, however future research could implement a diary spanning the first year postnatal to capture how recording PGD changes over this period. As both

participants were first time mothers, the findings only reflect this stage of motherhood. It would be useful to examine if second time plus mothers or adoptive mothers would engage with the journal or find it a useful tool for capturing PGD in the postnatal phase.

4.7. Next steps

At the end of the six-month period, it was apparent that contact with health professionals was much reduced and therefore technology use and seeking advice and information through social media increased. This allows for future exploration of how access to health professionals changes over time following birth and along the postnatal period, in the next chapter we gain a health professional perspective of how support and information is offered to new mothers along the timeline of motherhood, and which services are provided to new mothers during this stage.

Chapter 5: Study 3: A health professional perspective: support, technology use and information exchange with postnatal mothers

5.1. Chapter 4 recap and study rationale

Study 2 provided an in-depth examination of how two new mothers found the experience of first-time motherhood, information, and support during this early postnatal stage. The study showed the need for information following birth, including information about recovery, expected mood changes and baby development, which is often met through internet use and extracting the information online. A reluctance to seek support from health professionals for minor concerns was evident, with mothers only approaching health professionals for medical issues regarding their infant. The mothers were more likely to share personal information with a health professional if a good relationship had been built prior, this was apparent for sharing experiences of postnatal mental health and seeking support. The journaling process acted as a positive tool for encouraging self-reflection and coping with the challenges of new motherhood, to which a digital format was positively critiqued providing advantages such as functionality and ease of access with barriers including privacy and access to information. From the results of study 2, it was apparent that a focus on information and support provided particularly in the postnatal phase from a health professional perspective would provide insight into current healthcare practise and antenatal and postnatal care provided to UK mothers. This is outlined in the current chapter.

5.2. Introduction

5.2.1. Antenatal health professional information and support

Currently in the UK, pregnant women have access to antenatal health professional support within the NHS with a set structure of appointments throughout pregnancy to assess the wellbeing of the mother and unborn child. First time mothers are offered a minimum of ten antenatal midwifery appointments, occurring at 8-10 weeks, 16, 25, 28, 31, 34,36,38, 40- and 42-weeks' gestation (NHS.UK) reducing to seven appointments for second time mothers. In addition, expectant mothers are also offered two ultrasound scans to examine growth and health of the baby, this usually occurs between 8-14 weeks and 18-20 weeks gestation (NHS.UK).

At each antenatal appointment, information is provided to mother and general health checks are performed (nhs.uk). However, research has shown that during pregnancy and early motherhood a 'gap in care' occurs (Peyton et.al., 2014), where women do not have direct access to health professionals. Long time periods between antenatal appointments can lead expectant mothers to seek information from other sources, most commonly online or digital resources (Kernohan, 2011). First trimester of pregnancy, followed by postpartum appeared to the times where new and expectant mothers felt information was lacking from health professionals (Peyton et.al., 2014; Henshaw et.al., 2016). Mothers often use sources such as mobile health apps and online information to seek information relating to foetal growth and pregnancy symptoms. Continuity of care from antenatal to postnatal health care providers is important for women transitioning from pregnancy to motherhood (Barmani & Hylander, 2012) as this can affect maternal wellbeing outcomes. Relationships formed with antenatal care providers are regarded as important for pregnant women to feel comfortable sharing personal information however women can be reluctant to share information found online with their health provider (Syakhot, 2016).

5.2.2. Postnatal health professional information and support

In the postnatal phase, new mothers have access to health professional care from a midwife for up to 10 days after birth, which is handed over to a health visitor from 10-14 onwards and then a routine general practitioner appointment is arranged to perform a general health check on mother and baby between 6-8 weeks post birth (NHS.UK).

Mcleish et.al., (2020) found that first time mothers receive mixed support from health professionals and that reassurance from midwives and health visitors was valued by postnatal mothers more than the positive appraisal which came from family and friends. Despite this, experiences with health professionals often left mothers feeling less supported. Criticism or judgement was reported from new mothers who had experienced postnatal health professional care and a need for tailored information was apparent, mothers reported being overloaded by the volume of written information but felt their information needs were unmet and desired a more personal experience from health professionals, particularly surrounding breastfeeding challenges. It was evident that first time mothers required emotional support from health professionals alongside physical checks and written information. (Mcleish et.al, 2020).

A study of first- time mothers' expectations of postnatal care revealed that ideally new mothers would prefer physical and mental health checks to be part of their postnatal

care however their reality was that often only checks on mother and baby's physical health occurred (Alderdice et.al, 2020). First time mothers also require help with feeding baby however women expected that only information on feeding, rather than more practical and emotional support would be provided by health professionals (Alderdice et.al, 2020). First time mothers also desire information on available information support after postnatal professional care has ended, along with information on the care structure they will receive from midwives or health visitors after giving birth (Alderdice et.al, 2020).

5.2.3. Health professional perspective

From a health professional perspective, the continuum of care following birth is often difficult. Factors such as high workload and communication difficulties with other health professionals affect ow postnatal care is given as does the mode of information transfer between practitioners i.e., paper based or in person. (Van Stenus et.al., 2020). Transfer of care between healthcare professionals is also made more difficult due to the logistics of in person handover and the volume of paperwork involved. This shows a need for improved communication between services who deliver postnatal care to new mothers for good quality care to be provided and new mothers feeling supported through this period.

A midwifery perspective on breastfeeding support demonstrated that the largest barrier to providing successful breastfeeding support was time constraints (Swerts et.al., 2016) and this was most common in hospital settings on labour wards where short staffing was an issue. Breastfeeding support provided to new mothers in hospital consisted more of information leaflets rather than hands on practical support. However, providing breastfeeding support plays a role in improving job satisfaction and increasing fulfilment in postnatal care so it essential that support from a midwife and particularly breastfeeding support is offered to new mothers for them to gain a positive postnatal care experience. Baker et.al. (2021) found that health professionals providing breastfeeding support in inpatient settings noted that establishing a good rapport with new mothers can lead to improved feeding support. However, hospital staff described a need for further support and training to ensure a successful delivery of good quality breastfeeding support to new mothers in hospital (Baker et.al., 2021). Currently in the UK, midwives views on postnatal care revealed that due to early discharge from hospital after giving birth, community midwives are assigned clients with high care needs for issues such as breastfeeding, jaundice and infections (from

vaginal suturing) which places pressure on community services (Kokab et.al, 2021). Extra pressures on referrals and availability of additional services for postnatal mothers is difficult due to limited services availability, for example re admission to hospital becomes difficult to justify to other health professionals, which can affect the relationship and care provided by midwife to new mother. Lack of resources available to community midwives also caused strain as this could impact on the success of home visits with new mothers, for example access to tools such as bilirubin measures to check for jaundice in the baby could impact negatively on the level of care community midwives are able to provide (Kokab et.al, 2021).

5.3. Rationale

Studies have focused on the attitudes and experiences of new and expectant mothers and there is limited research examining the perspective of health professionals. This study examined the views of health professionals, who have experience of delivering care to pregnant and postnatal mothers to understand more about the information exchange opportunities that occur as part of their role.

5.4. Research Question

The following research question was applied to the current study to capture how health professionals are providing information and support both antenatally and postnatally and how they can encourage information exchange with new mothers. In addition, the role of technology in assisting in information seeking and sharing will also be examined.

1. How is support and information provided to pregnant and postnatal mothers from a health professional perspective?

5.5. Method

5.5.1. Research approach

A qualitative approach was taken to form a deeper understanding of how information and support is offered to expectant and new mothers from a health professional perspective. Semi structured interviews were devised and adapted to apply to either midwives or health visitors, thematic analysis (Braun & Clarke, 2006) was used to analyse the qualitative data.

5.5.2. Participants and Sampling

5 health professionals (Table 4) included 3 midwives (1 retired, 2 currently practising) and 2 health visitors (1 retired, 1 currently practising) were recruited via purposeful

sampling to take part in semi structured interviews examining what information and support is offered at the antenatal and postnatal stages. Both current practising and retired HCPs were included in the sample to assess how the provision of antenatal and postnatal care has changed over time and how retired HCPs perceive the current practice. This offered further insight into how the structure of care has changed and how this might impact new mothers, particularly around the reduction of HCP contact in the postnatal phase.

Recruitment was made difficult due to the Covid-19 pandemic, and it was felt that it was no longer appropriate to try and recruit healthcare professionals during this time. The interview data obtained from the five participants still provided an in-depth perspective on the changing landscape of visits and interaction opportunities, and rich detail about the information and support offered to new mothers both antenatally and postnatally.

Table 4: *Participant demographics for HCPs*

Profession	Occupation status	Location	Experience
Midwife (1)	Currently practising	Northeast England	Newly qualified (less than 2 years)
Midwife (2)	Currently practising	Lancashire, England	10+ years
Midwife	Retired (2010)	Northeast England	20+ years
Health Visitor	Currently Practising	Northeast England	10+ years
Health Visitor	Retired (2004)	South Yorkshire, England	10+ years

5.5.3. Materials and Procedure

An interview schedule was devised to meet the outcomes of the research question and was adapted for interviews with the midwives or health visitors as midwives have more antenatal contact with expectant mothers and health visitors have more contact with postnatal mothers. Interviews examined the experiences of caring for pregnant/postpartum mothers and how appointment/home visits are structured, relationships are built up and thoughts about the use of technology to provide

information to new and expectant mothers. Interview questions relating specifically to the midwives included 'Can you tell me about the general timeline to your meetings antenatal meetings?', 'How would you say your relationship with your client develops over the course of pregnancy?', and those specific to health visitors included 'What information do you provide to a new mum during the first postpartum visit?', 'What kind of support do you/can you offer to a new mum who was struggling with postpartum mental health or physical recovery'. Both health professionals were asked questions relating to current use of the child record health book (red book) and thoughts on clients using technology to seek information (See Appendix 8 for full interview schedule).

Interviews occurred either face to face at a location of the participants choosing (on university campus or in a public quiet space), or online via the Facetime app. All participants were provided with information sheets and gave their informed consent. Interviews ranged from lasting 45 minutes to 1 hour and were all recorded using a Dictaphone or a mobile voice recording app.

5.5.4. Data Analysis

Interviews were transcribed and coded into NVivo, the six stages of thematic analysis (Braun and Clarke, 2006) were applied to allow common themes to present from the data. Thematic analysis was chosen as the analysis for this study to ensure that the produced themes were created from a bottom-up approach and driven by the data. It was expected that similarities may occur between themes from studies 1 and 2 based on the current study being an HCP perspective of pregnancy and postnatal care, however it was felt that producing a priori themes would limit the findings. Thematic analysis ensured that all data was analysed objectively and allowed new themes to reflect the perspectives of both retired and practising HCPs. Transcripts were initially read carefully, and initial notations made, followed by thorough coding of transcripts, themes were then created, presented and discussed.

5.5.5. Ethical Considerations

Ethical approval for this study was granted by Northumbria University Ethics Committee (Ref: 20901) and ethical consideration was given throughout the course of data collection, informed consent to record and transcribe participant data was given prior to the interview commencing.

5.6. Findings

From the analysis, four themes (Table 5) were created to reflect how the health professionals engage in information and support provision with expectant and new mothers (practising HCPs), and previously (retired HCPs) and how the structure of care has changed over time. Themes explore how the structure of appointments has changed from the perspective of the retired HCPs to those currently practising, and how currently there are fewer appointments offered to expectant mothers over the course of pregnancy but particularly in the postnatal phase where visits have vastly reduced.

The findings show that HCPS offer a great deal of information to clients in verbal and written form, but there are also opportunities for clients to share personal information with midwives and health visitors. Sharing personal information can alert HCPs to the mental wellbeing of mothers and over the course of pregnancy and postnatal there is a strong focus on mother's mental health. However, access to support is not always easily available and often only cases of severe antenatal or postnatal mental health are referred to specialist services.

While HCPS were generally positive about the potential for digital information to be stored and shared between clients and mothers, they were also cautious about information shared online and the safety of this information and highlighted the issue of digital exclusion.

Table 5: *Overarching and sub-themes of findings from thematic analysis*

Overarching theme	**Sub-theme**
The routine nature of appointments	• Continuity of care for relationship building • Change in appointment structure from retired to current HCPs • Postnatal home visits centred on health of mother and baby

A two-way exchange: Information sharing, new mother's and HCPS	• Signpost to trusted digital information sources • Gaining personal information from mother • Information provision from HCP to client • Communication between HCPS
A focus on mum's mental health	• Assessing mental health needs of clients antenatally and postnatally • Additional mental health support offered from health professionals • Referrals and access to external services for mother's mental health
Digital record keeping for mother and baby	• HCP's current interaction with red book • Advantages to a digital record keeping source • Barriers to digital red book/ mum journal

5.6.1. The routine nature of appointments

Throughout pregnancy there is a standard structure of appointments offered to all women ante and postnatally, with slightly fewer appointments allocated to second time plus mothers. Antenatal appointments are routinely to check the expectant mothers blood pressure, urine sample, fundal height and address any concerns between midwife and client. The midwives described how relationships would be formed from the booking appointment and developed over the course of the pregnancy, continuity of care and having a named midwife allowed better relationships to form. The structure

of care appeared to be person-centred, high-risk mothers and those carrying multiples would be offered a more tailored care plan with additional appointments provided for monitoring of mother and baby. In the postnatal phase additional appointments are offered by mothers' request for both midwifery and health visitor care. From a health professional perspective, all postnatal appointments are equally focused on the health and wellbeing of the baby and new mother, offering physical checks to both.

5.6.1.1. Sub theme 1- Continuity of care for relationship building

The healthcare professionals discussed how building up a relationship with the client at the antenatal stage was important for providing the client with continuity throughout pregnancy and ideally postnatally. Midwives stated that setting up the care structure from the first 'booking' appointment would set the basis for developing the relationship over the course of the pregnancy. It is hoped that once allocated to a midwife, the clients would receive all their antenatal care from this particular midwife up until delivery.

> *'I think it's really important the first appointment because it's setting up all of their care and particularly where I worked we tended to caseload the women, so ideally they would be booked by the midwife who was going to look after them for all of their care'- Current midwife (2)*
>
> *'Yeah, I think if you are seeing them at every appointment you tend to get a good relationship with them'- Current midwife (1)*

By providing a lot of personal information at the booking appointment, health professionals can refer to this information over the course of the appointment timeline and knowing this information can produce a more tailored care plan which has a positive effect on the relationship built with the client.

> *'you get to know them and you get their history, so then going on for further appointments in the future you can then, you know their history and you sort of gain a relationship with them' – Retired Midwife*

The retired midwife interviewed stated that continuity of care should ideally extend into the postnatal phase, this way new mothers would be familiar with their healthcare team. Extending into the postnatal phase could make it easier to discuss any challenges the new mother was dealing with as the relationship with their healthcare provider would be previously establishing throughout the pregnancy.

> *'But it was quite good in the fact that they had really good continuity antenatally and postnatally seeing the same midwife, and because we worked*

in small teams, if it wasn't me it was one other person maybe two who they would see throughout their pregnancy'.- Retired Midwife

Although health visitors do not begin formal visiting with the new mother and baby until the midwife has completed their postnatal care, the health visitor interviewed stated that antenatal contact is essential for the client to establish their relationship and find out information about the expectant mother prior to postnatal care being offered. When meeting for the primary visit postnatally, the home visit could run more efficiently if antenatal contact has occurred and the health visitor is aware of any potential concerns which may arise with the mother or baby.

'Absolutely. It's very different if you don't do that antenatal contact …So you know sometimes we do get people that haven't been seen antenatally and yeah it's different. I'm not saying it doesn't work and you know … so you can get to know people but I think the antenatal makes a massive difference.' *– Current Health Visitor*

5.6.1.2. Sub theme 2 - Change in appointment structure from retired to current HCPs

There appeared to be a noticeable difference between how the retired midwife and health visitor described the appointment timeline and structure compared to those currently practising. A significant reduction in antenatal appointments but more specifically postnatal home visits has occurred with some maternity services only providing one postnatal home visit to new mothers.

Current midwives described on average eight antenatal midwifery appointments for a low-risk pregnancy and an additional two ultrasound scans to check the health of the baby. However, the retired midwife who practised prior to 2010, described a total of twelve antenatal appointments offered to expectant mothers showing a large reduction in face-to-face contact with midwives over the course of pregnancy.

'your first booking appointment which is usually between 8 and 10 weeks, there's then a scan at 12 weeks, well 12-14 a dating scan, you would then have your 16 week appointment with the midwife, a 25 week appointment with the midwife where you have a scan in between 18 and 20 weeks, we then see them at 28 weeks, 31 weeks, 34 weeks, 36 weeks, 38 weeks and 40 weeks'. – Current midwife 1

'was 16 weeks, 20 weeks, probably 24,28, 30 and then I think it was 2 weekly from 30 weeks and then 36 weeks I think you maybe see them every week, you did see them quite alot up to the last one if they hadn't delivered by 41 weeks you would maybe do a little assessment and book them in for any inductions'- retired midwife

The retired midwife discussed a noticeable difference in the reduction of antenatal appointments and postnatal home visits over the course of her working career as a midwife. For postnatal midwifery care, the retired midwife spoke of longer hospital stays and continued care after the mother is recovering at home however as they got closer to retiring this care dramatically reduced.

'We saw them a lot more often, before I retired we were reducing visits quite a lot even ante and postnatal- even as I was starting to go because I did work community for the last four or five years and maybe six years and I would hear the girls saying oh they've cut everything back and it's just a couple of visits' – Retired midwife

This was also echoed from the practising midwife who also stated how postnatal care is lacking, and appointments are now minimal with as little as only one home visit being offered to new mothers. The second current midwife described that in their location of work a total of three home visits were offered to new mothers. Generally, both midwives appeared to agree that postnatal care currently given to new mothers is insufficient.

' I think sadly postnatal care is going very minimalist, certainly from when I first trained as a midwife the amount of visits they get now is so much fewer… . So most women only now get one visit at home'..- Current Midwife 2

'So we go out routinely for a primary visit, so that is the day after they've left the hospital, day 5 to do the newborn blood spot and then day 10 is the final visit when we hand the women over to the health visitor'- Current midwife 1

The structure of home visits provided from the current health visitor also appeared to be a total of three visits offered routinely to mothers as standard practice, however mothers also had the option to request further visits or use the telephone service for advice between appointments if they had any additional concerns.

'So the healthy child program does set out minimal contacts, so routinely if people are managing well we do the 10-14 days primary, then the next routine is at 6 weeks. After that 6 week contact, for the health visitor is 12 to 16 weeks. So again in between the visits that we would do routinely there's clinic, there's the opportunity to telephone for advice or request a visit'.- Current HV

The retired midwife also mentioned that mothers could request further visits postnatally if they felt they needed some additional support after the routine 10-14 days post birth handover to the health visitor. The midwives stated that access to care was available for up to 28 days post birth which was person centred around the needs of the new mother.

'you would leave it to the patient, how do you feel about another visit and do you want another visit and we would feel we'd have a discussion and say when do you think you need another visi't- Retired midwife

5.6.1.3. Sub theme 3 – Postnatal home visits centred on health of mother and baby

The health professionals in the current study were asked to provide detail of the care structure of postnatal home visits to gain a health professional perspective of how these appointments are allocated to both mother and baby. Both midwives and the health visitor interviewed stated that postnatal home visits aim to cover full health and wellbeing checks of mother and baby equally and that thorough physical checks of the mother are performed as well as a mental wellbeing check up to assess any mental health concerns that may have arisen following birth.

'But on the primary we tend to go out just check they are settling in ok at home, we ask how the feeding is going, we do a postnatal check on mam and baby so we ask her things like how her bleeding is, we have a feel of her uterus to check it's firm and contracted, we check if she is on any medication like tinsparin or iron and make sure she's taking those and just ask her about her general wellbeing' – Current midwife 1

'in terms of baby we want to make sure that baby is feeding 3-4 hourly, and that obviously if it is bottle feeding that baby is taking good amounts or breastfeeding, see that there might be a case of doing a breastfeeding assessment to check if baby is latched well'- Current midwife 1

This was also echoed from the retired midwife who described the full 'head to toe' checks which new mothers would receive at postnatal home visits. As well as physical checks, a general assessment of the mothers mental and emotional wellbeing would also be performed.

> *'it's a top to tail check it's seeing you know head, eyes, mouth down to the bottom, how we feeding, just a general you can tell if a baby is well just by the handling can't you. And mummy it would be the same how are you, are you tired are you getting your sleep, you getting plenty of breaks, checking breasts, checking fundal height, checking your loss, any stitches you would check, check the legs were ok no swelling or pains in calves or anything, just really a top to toe again'.- Retired midwife*
>
> *;we are just making sure that the health and wellbeing of both are good and then we can signpost if there is any questions. For mother we will inspect her perineum and look for any signs of infection and things like that so the appointments are really for both of them to check both of their health'.- Current midwife 1*

From the perspective of the current health visitor, physical checks are focused more on baby, however given that health visitor care begins 10-14 days after birth it is likely that a new mother's physical recovery is well underway compared to the 1-10 days post birth checks completed by the midwife. The health visitor did state however that mothers' mental wellbeing is an important aspect of the visit and would always assess how the mother was feeling and if they have good support from family and friends.

> *'We check for jaundice, any birth marks, any marks on the body, any concerns that the parents would have. So we would discuss any that might come up with the mother but we would be certainly, feeding safe sleeping, coping with crying, and obviously feeding are sort of big things, vitamins if they are breastfeeding to make sure mums are doing that.' – Current HV*
>
> *'we would always ask how the mother is feeling as well. So if their mood is a bit low, how they are coping and what sort of support they've got round.'- Current HV*

5.6.2. A two-way exchange: Information sharing, new mother's and HCPS

Throughout antenatal and postnatal appointments, information is provided to clients including written information at specific time points such as 16 weeks (safe sleeping) and 36 weeks (birth plan). During antenatal and postnatal appointments information is gained about the mother and also provided to mother, information exchange occurs with health professionals signposting clients to trusted information sources and provided reputable sources of verbal and written information to clients.

When midwifery care is handed over to the health visitor in the postnatal phase, there is written communication between the health professionals and little verbal or face to face contact.

5.6.2.1. Sub theme 1- Gaining personal information from mother

Throughout pregnancy, health professionals must gain information from the expectant mother to build a tailored care plan to be followed until birth and beyond. Midwives explain that most of this information is provided at the initial booking appointment which occurs between 8-10 weeks gestation. Expectant mothers provide personal information at this appointment which covers 'health history, previous pregnancies and family history', midwives assess from this appointment which mothers will be categorised as 'high risk' and who will need additional monitoring throughout the pregnancy.

> *'Mostly their history, their health if they've got any health conditions we want to know their BMI, if there's anything we should know that would make them high risk, anything about previous pregnancies, just a general insight into if they've got any medical or health conditions that would put them at risk in the pregnancy'.- current midwife 1*

At the initial booking appointment, expectant mothers are also provided with a set of notes to store all of their pregnancy health related information in. Information that is discussed at the booking appointment is kept in these notes and the expectant mother retains this information until birth.

> *'Just to get an idea of her family, what her status was, how she was going to cope, was it her first baby how did she want to deliver and what her choices were….You were sat with a set of notes, you would get a set of notes and start them off and all the information of family history, health history, previous*

pregnancies, all of that. Last period date, from the basics right through until if there is anything seriously wrong with them'- retired midwife

Midwives were asked how they approach their new clients to encourage information sharing, as the relationship is new and trust not yet established, the new mother is asked to share personal information. The current midwife explained that building a good rapport and making their clients feel at ease and supported at this stage often encourages the new mother to share personal information. Beginning the conversation with friendly chat between midwife is often approached initially before asking personal questions from the outset.

'Suppose the approach first is to try and make them relax and try and make it less of a this is an interview and these are the questions I've got to ask you a bit more two way and often you'd start with demographic information and you know where do you live? And 'oh I know where that is' and 'what do you do for a job?' and 'oh tell me a bit about that' just try make them relaxed and feel you are interested in them as an individual and not just a set of questions and then unfortunately there is the bit- any booking information that is sort of like we need to know about your history and previous pregnancies'- current midwife 2

When the health visitor is assigned during the antenatal phase, they send out a 'health needs questionnaire' to their new client to gain information about the expectant mother prior to the first home visit. This information allows the heath visitor to identify and set up additional support in the postnatal phase if required. As stated earlier, having face to face contact in the antenatal phase contact with the health visitor may make it easier for the new client to share personal information which will result in a more tailored care plan postnatally.

'health needs questionnaire, and that was developed locally in the county and the reason for that is to get some background information from people and just to be able to identify whether there is any more support that might be needed postnatally'- Current HV

5.6.2.2. Sub theme 2- Information provision from HCP to client

As well as gaining information from the expectant mother throughout pregnancy, there are also time points where information is provided from the healthcare professional to help prepare the mother for what antenatal and postnatal care they will receive.

Information provision from the midwife begins at the initial booking appointment, expectant mothers are given leaflets containing information about what screening would be available for mother and baby throughout pregnancy. If the expectant mother currently smokes, they will be offered information about smoking cessation as well as health information on what foods are not suitable to eat during the pregnancy.

> *'because you kind of need to get the right information to get on the right path over the pregnancy, but there's also a lot of information given as well. …where I worked they had a first stage meeting where women would go and be given sort of like a lot of health information and information about what was going to happen in that appointment so what screening tests you are going to be offered, they would be screened for if they smoke and given advice about stopping smoking and be told what to eat and what not to eat' – current midwife 2*

As expectant mothers usually have a choice of what hospital they wish to deliver at, they would be provided with information about specific units or the possibility of home births. The retired midwife also explained that expectant mothers would have an option to visit their chosen hospital unit however this was not reiterated from the current practising midwives.

> *'they got a choice of what hospital they wanted to have the baby and whether it was a home delivery, or hospital and they got what hospital they were hoping to choose…. broad spectrum of information leaflets and we went through basically what her care would be and how we would be available for them for the next, til the delivery…..there was lots of leaflets to give out and some women would say they'd maybe talk about them later on, things like testing and the hospitals they would look etc etc. at the time we could visit the hospitals but mostly did that once they were nearer delivery'- retired midwife*

Both the current and retired health visitor spoke about information provision to clients which appeared to be more specific to the needs of the baby for example, safe sleeping, immunisations, and child development. However, some information seemed relevant to both mother and baby included coping with crying and feeding support, however information specific to postnatal mothers appeared to be lacking.

> *'we would always mention safe sleeping, bed sharing, we have something that is called icon, coping with crying, feeding obviously supporting whichever*

method the mother might have decided, breastfeeding or formula feeding.'- current HV

'Yes that would always be part of the birth visit to talk about back to sleep, the immunisation program, the child development, child health surveillance program'.- retired HV

5.6.2.3. Sub Theme 3- Signpost to trusted digital information sources

When discussing information that clients found online and shared with their antenatal or postnatal health professional it was clear that health professionals are aware of the risks of misinformation therefore attempt to signpost clients to trustworthy online sources. As not to discourage clients to share information they had found online, a gentle approach is taken to encourage the use of accredited sources that contain evidence-based information to ensure clients are being signposted to the most appropriate sources.

'I think we would prefer them to use the websites that have all been evidence based and recommended by our trust, and they are not going to be given mixed messages'.- current HV

;of course I'd ask what the site was and what the, if she'd used Facebook and exchanged misinformation you don't want them to – I'd say oh that's interesting but the sources I'd use might be XY and Z and state NHS research.'- current HV

Specific sources such as the NHS and NICE were recommended among the health professionals and were described as 'official' sites where clients would be able to search for accurate and trusted information. Other websites signposted by the health professionals included the lullaby trust where new mothers could gain information about safe sleeping for babies.

' we refer people to the lullaby trust and we do have this useful links..Now that's all evidence based websites for kind of all the general needs that you would potentially have as a new parent and we would always signpost to like the lullaby trust and get them to have a look at that.'- current HV

'No if any of the leaflets we gave out they would maybe have a little reference on them but it would all be sited through NHS and NICE and stuff like that, through official sites you know. Not google'.- retired midwife

As well as referral to websites, a health professional recommended app is also promoted to clients, baby buddy is a pregnancy and parenting app which contains information tailored to both baby and new mothers (and fathers) and is designed by health professionals and accredited by the NHS. The app is designed to give parents additional support and advice in the first five years of their child's life.

'baby buddy, that was an app that (North East) NHS trust invested a lot of money in to, and we still give people the information about baby buddy at the moment, and there's lots of links into other searches and things like that which are all evidence based as well'- current HV

5.6.2.4. Sub theme 4- Communication between HCPS

When the midwife hands over care to the health visitor at 10-14days postnatal, there is little verbal communication between the health professionals, information about the mother and baby is exchanged as written communication. A 'discharge sheet' or 'form' is filled out by the midwife and stored in the child's health record book to be picked up by the health visitor at their primary home visit.

'it may be that we don't see the midwife at all, they would complete in the personal child health record book that red book ,they would complete their transfer sheet and they also do a discharge sheet for health visitor'.- current HV

'But basically what we do is we fill in a form and it's the general hand over to the health visitor and it will just ask about mum and baby, if they are well if there is any concerns, if they are on any medications, and we put all that on a sheet and that just gets posted to the health visitor.'- current midwife 1

From the current practising health professionals to the retired, it was clear there has been a change in the way that communication occurs between midwives and health visitors during the handover. The retired health visitor stated that when practising, the handover was a verbal communication and there would be minimal written communication, only being provided with a sheet to inform of the condition of the baby and details of the mother's labour.

'Yes, I get a slip of paper telling me about the labour and the condition of the baby at birth. But that would be all that was written, it would be a verbal communication how things had been going. And I might write in my records birth visit arranged midwife no concerns. Something like that, to show we'd had a conversation'. – retired HV

It was clear that from a retired health professional perspective, communication between midwives and health visitors was very important to be able to flag up any concerns regarding the families currently under postnatal care.

'You would have your communication sheet that you passed over and it would go into her mail and if we had any concerns we would flag it up…But again it's all about communicating with people and I think we were quite good at that'.- retired midwife

5.6.3. A focus on mum's mental health

Mental health assessment occurs from booking appointment and first access to antenatal care and referrals to external mental health are made for those scoring highly on mental health assessments. Health professionals describe tracking and prompting clients to discuss mental health issues however for those dealing with less severe mental health, access to support appears difficult. Often partners report mental health concerns to midwife or health visitors at home visits.

5.6.3.1. Sub theme 1- Assessing mental health needs of clients antenatally and postnatally

Throughout pregnancy and the postnatal phase, midwives and health visitors described assessing the mental health state of expectant and new mothers. Scales such as the Edinburgh depression inventory are using to record a baseline of the mothers' mental wellbeing and this is used to make decisions on whether additional mental health support is required during pregnancy or after birth.

'Well we use the Edinburgh depression inventory but I'm not sure because it's , you know my personal feeling is that it's quite clear what that is about and it may help people to start talking about those issues'- retired hv

Tracking the expectant mother's mood throughout pregnancy is important to see if any changes occur, that can ensure early concerns to be raised and lead to the correct support being offered to the client before giving birth.

'But the community midwives as well will ask at every appointment how they are feeling in themselves and if they've got any concerns and just a general insight as to how their mood is'. – current midwife 1

After birth, both the health visitor and retired midwife discussed mental health assessment, as the postnatal stage where mood changes may occur, for example due to hormonal changes after giving birth. The health visitor stated that gathering information prior to the primary postnatal visit, in the antenatal phase can determine whether the new mother would be higher risk for postnatal mental health issues, for example if they had disclosed a previous diagnosis of depression or anxiety.

'Antenatal health needs assessment we would have been able to have talked about any previous anxiety or depression she may have had so you would have an idea whether that was something new or whether it was something that was potentially a risk for her'- current HV

The health visitor and retired midwife discussed how they would approach the sensitive topic of postnatal mental health, it included questions on how mother is feeling and alerting her to common changes in mood to expect in the early postnatal phase. Reassuring the new mother and taking a soft approach to allow mothers to open up about their mental health was implemented by both healthcare professionals.

'Well again you are chatting, how are you feeling, are you sleeping? how are you coping? and you'd say how are you feeling round about the 3rd or 4th day when your milk comes in and are you feeling a bit weepy, you know don't worry if you are feeling like that it is normal'.- retired midwife

'its difficult for people regardless, to often say that first time you know I am really struggling. So I think it is just encouraging people and non judgmental and just being reassuring as well. So it's a softly softly approach unless there was any real risk that you felt'.- current hv

5.6.3.2. Sub theme 2- Additional mental health support offered from health professionals

As mental health assessments are made throughout pregnancy and postnatal, sometimes additional support is offered to clients through extra appointments from their named midwife or health visitor. The current midwives explained that women can be seen every one to two weeks if they are struggling with mental health issues which concern themselves or their baby.

'So those women I would tend to see more often and particularly if they've had a really anxious time I tend to offer them they can come every two weeks but because where I worked they had a named midwife policy, they could ring up and if they were anxious we would try and fit them in….But obviously then the balance is if you are getting someone that's ringing you know every few days you kind of need to look actually do they need extra mental health support because although listening offers some reassurance it only really tells you that at that point everything is fine, you can't predict whats going to happen.' Current midwife 2

The health visitor discussed offering 'listening visits' which are home visits solely focused on the mother to allow her to talk about mental health to which the health visitor can make an informed decision as to whether further support is needed for example from the general practitioner.

'And we can arrange to go back and do listening visits if that is helpful, we can do that initially because quite often just talking through how you are feeling makes things a lot better rather than bottling everything up, and then you may be able to, on that support delve in to what is going on around them a little bit more and if need be we would seek their permission to speak to the GP.'- current HV

For mothers who have discussed experiencing mental health issues in the past, a baseline is taken at the booking appointment, the midwife will discuss with the mother what to expect throughout pregnancy but would not offer extra appointments initially. However, if the expectant mother had experienced previous loss, generally having increased anxiety particularly in the early stages of the pregnancy then additional appointments would be offered for reassurance to the mother and to listen to baby's heartbeat.

I normally would do an anxiety and depression scale at booking as a sort of baseline …and obviously discuss that pregnancy is a really emotional time and if things are getting worse just give me a call…..I probably wouldn't initially offer them extra appointments at that point depending what it is, so if there's particularly ladies who've had previous loss…normally from around 16 weeks because often the anxiety is about listening to baby's heartbeat – current midwife 2

But yeah I think it's more if they've had PTSD from a previous pregnancy or if they've had pregnancy loss and would like to be seen more often, and there have been circumstances like when i was on placement in community we'd see the women weekly if they felt like they needed it, the appointments were there. – Current midwife 1

5.6.3.3. Sub theme 3- Referrals and access to external service for mother's mental health

When clients disclose mental health struggles, midwives and health visitors can offer extra support, however when the mental health concerns are severe this can warrant referral to external services. However, for mothers who are experience moderate mental health struggles these services can be difficult to access and support is generally only offered to those who score severely on scales of anxiety or depression.

Prior to 16 weeks gestation, external support is difficult to access or unavailable. Due to the 'stretched' nature of specialist services, expectant mothers would have to score as experiencing severe anxiety or depression to be offered access. It appears that mothers who score moderate to severe on such scales would not be offered external support, therefore would need to rely on the extra help offered from their named midwife or health visitor.

'before 16 week if you don't pick it up it's quite normal because baby is quite small, then you have nowhere to refer them to because a lot of the services won't see them before 16 weeks if there's just no fetal heart and they are not bleeding or anything… There is special services where I work but I've got to say because they have stretched specialist services you have to score really highly on the anxiety and depression scale before they would perhaps see them'- current midwife 2

The health visitor described a talking therapies service which is available to mothers as a self-referral option, however, usually wouldn't encourage this as an initial step and would perhaps offer extra listening home visits prior to this.

'There is talking therapies as well which they can self- refer into, but I think that initially that postnatal stage it's quite a big step for somebody to take as first off.' – current hv

5.6.4. Digital record keeping for mother and baby

When asked about the potential advantages and challenges to digital sources of the new mum journal and digital red book it was mostly met with a positive response, both midwives and health visitors believed these digital sources would be beneficial for new mothers to keep track of their own information and have easy access to information relating to mother and baby. Challenges mentioned included access to technology for those living in low socio-economic areas and privacy issues to who would have access to the information. One health visitor spoke of a current parenting app to act as a 'one stop shop' to provide all information digitally that would usually be provided in written form. This could be beneficial to new mothers who have less access to health professionals postnatally but still have information needs regarding what to expect in this phase.

5.6.4.1. Sub theme 1- HCP's current interaction with red book

Before being asked to share thoughts on digital versions of child and mother health record keeping, health professionals were firstly asked about how they interact with the 'red book' and what information they input into it.

A current health visitor explained that the red book is a two-way information source, which can benefit both parents and health professionals. Information stored in the red book covers areas from children's health development, e.g., record of immunisations, to development such as first tooth and smile. It can be a useful source to both record and store all of baby's early development milestones and be used by the health professionals to keep track of their health and medical progress.

> *'So the red book we try to encourage people to really look at it as a great resource, a record of all their baby's kind of checks and immunisations, their growth and something that benefits them as well as health professionals. There's obviously the developmental sort of drawings in the back, first smile and tooth and things like that and there's lots of really good information in there aswell. So yeah obviously we use the red book to record any of the routine reviews that we have aswell.' – current hv*
>
> *'I think it's for the mother and the child, it's something that they've got forever and they can look back on. So the fact that we record in it is really for them to have a record at that particular review.'– current HV*

When the child record health book (red book) was first introduced, there was some apprehension surrounding use of it. However, the retired health visitor explained that this was a tool for both health professionals and new mothers to work together, and have a source for recording information that was discussed at home visits from both the mother's perspective and that of the health professional.

> *'For me I think a lot of people were really anxious when that health record came out, but for me it was the basis of working together with the family. I try at the end of the meetings day well how shall we record this visit, so that I'm writing something down that somebody it's usually the mother, that the mother could sign up to, yes that is I think what I think we set out to do and it's what we've achieved.' -retired HV*

Although health visitors have the most use of the red book as health professionals, midwives have some interaction with it. A current midwife explained that useful information is stored in the document that can be seen by the parents and other health professionals, for example the discharge letter to the health visitor.

> *'The only time we use the redbook is, we print off a birth notification form so that's when we register baby.. …We put in a birth registration form, then we also put some stickers in which are just to go on to the newborn blood spot card. So we put some stickers in for that, then on day 5 in community we use a page which basically says that we've weighed baby on day 5, we write the weight in and says that we've done the blood spot and then on day 10 it says we have discharged to the health visitor. So we literally use one page in the redbook as a midwife'.- current midwife 1*

5.6.4.2. Subtheme 2- Advantages to a digital record keeping source

After discussing current use of the red book, health professionals were asked to share thoughts on how a digital version of this sources could be used. As reference to study two where a 'new mum journal' was given to postnatal mothers to record information about their experiences of motherhood, the current health professionals were also asked if a digital format of this journal could be advantageous as a tool to encourage information exchange and communication between health professionals and new mothers.

The practicality of transferring the red book from paper based to digital was discussed by one midwife, who stated that having all information stored digitally would make it

easier to find and more user friendly. Information on a digital source could be potentially engaged with more than a paper- based format as functionality would be improved.

> *'Some peoples files get absolutely huge with loads of paper and it's really hard to find the information that you need but especially for things like the red book it would be quite handy just because I don't actually know how many pages are used but it seems like quite a lot of information but it sometimes probably isn't even looked at by some mothers.'- current midwife 1*
>
> *'it probably should be online because quite alot of it is just general information like safe sleeping, feeding baby and that sort of thing so I think it would be helpful if it was just an online system'.- current midwife 1*

The second current midwife had mixed thoughts on a digital red book, stating that it would be useful to minimise the risk of information getting lost however had some concerns as to who ownership of information would have if it were to be stored electronically.

> *'if you've got an electronic version there's less chance of things going astray and being sort of oh well now we haven't got all the information that we need. I think certainly there could be some challenges around who has ownership of that information electronically.'- current midwife 2*

The health visitor echoed that a digital red book would keep the information in one place and reduce risk of being lost, and for clients transferring from another area their data could be easily transferred with them and easily accessed if stored electronically.

> *'I mean in general we are all up for progress and I mean some red books they get damaged, they get lost…. And actually aswell what happens sometimes is if people transfer from another area you know part of the country, they do vary they are not all universal so sometimes they are slightly different. So I suppose an electronic record might be easier.'- current HV*

When questioned about a digital version of the 'new mum journal' the health professionals responded well, stating this could be a good source for the mother to record information to then share with health professionals could be a good starting point in building a positive rapport.

> *'I wish I'd thought of it when I was health visiting, I had thought of it as I say in specific circumstances. But I guess it'd be like me reading the child health*

notification, where I've got how the delivery went and how the baby is doing and using that as to say to the mum, I've got what it says here but I want to know how it was for you. If a mum kept a diary then that's a starting point for helping build up the rapport that we've been talking about.'- retired HV

The current midwife felt the new mum journal would be a good tool to encourage new mothers to share personal information and input any questions they had to ask their health professionals. This would be a good way to encourage information exchange as the midwife could respond to question that had been stored and potentially offer more tailored support.

'Yeah it probably would be good for them to have a journal so you could read up on what they had been struggling on, it helps them to remember if they had any questions because it's very on the spot when you go out and it's like I feel like I had so many questions to ask you but I've forgotten them because you are suddenly put under pressure.' – current midwife 1

'I think it would be quite helpful for things like that to have a journal so you could look at it and say oh right so you said you were struggling with this have you got any questions and can I help you in anyway with it?' – current midwife 1

5.6.4.3. Sub theme 3- Barriers to a digital red book/ mum journal

Although the discussion around a potential digital record keeping source (red book or mum journal) was positive and health professionals stating advantages of functionality and ease of use and sharing there were also some potential barriers to having such electronic sources of information storing.

The retired health visitor discussed how digital sources could remove the personal element of healthcare and perhaps affect the relationship as the face to face contact becomes disconnected and having a 'screen in the way'.

'I think one issue is that as soon as something is digital I think it's easy, this is something I've noticed in consulting doctors, a screen gets in the way of you and the doctor or gets in the way of you and the client, so you are interacting with a device'- retired hv

The current midwives spoke about issues surrounding digital inclusion for mothers and access to the internet in areas of deprivation, making it difficult for certain mothers to use technology resources.

> *' I would worry about a perspective of people who don't have access to the internet and dont have a phone, couldn't access things online, I think that would be more my worry in terms of just incase if someone didnt have access to that information and then it would be nicer for them to have a handheld copy'- current midwife 1*

Concerns around the safety of information stored digitally were raided by one midwife, who also echoed that access to the internet could be an issue for some women who don't currently use electronic devices. However, the midwife did highlight some advantages stating that being able to keep track of personal information would be useful.

> *'I think people do like a physical copy of things and it's how do you keep that information safe and certainly where I've just worked, in a high area of deprivation a lot of women don't have laptops, they have phones but then its how often do they change their phones and things and then keeping that safe. But I think there's also a massive opportunity in terms of information not going missing, being able to keep track and things.'- current midwife 2*

From a midwifery point of view, as their care is completed quite early in the postnatal phase (10-14 days post birth), their interaction with a digital mum journal may be limited, and mothers may not have had the chance to store a lot of personal information which could be shared with the midwife during home visits.

> *'I think the issue from a midwifery point of view is that we see them quite early, so as I was saying we discharge some of these women that soon, how often they would put information on there. Because we are talking days we see them rather than weeks so I suppose that would be the issue.'- current midwife 2*

5.7. Discussion

The study aimed to answer the research question, **'**How is support and information provided to pregnant and postnatal mothers from a health professional perspective?'. From the findings there was a noticeable difference between information and support provided the perspective of retired midwives and health visitors to those currently practising, specifically around the timeline and structure of antenatal and postnatal

appointments. There has been a reduction in number of postnatal visits provided by healthcare professionals which current midwives appeared to feel concerned about. Offering continuity of care along the pregnancy to postnatal timeline was felt important to build up strong relationships with their clients, however due to the shift in care providers after birth this is difficult to achieve. Throughout pregnancy and the postnatal period there was ongoing information exchange between health professionals and clients, with specific time points where mothers were asked to share personal information or general information was provided to them. It was apparent that the mental health assessment of expectant and new mothers is adhered to in both antenatal and postnatal care, however referral to external services for mental health support was difficult. When asked about digitally storing and accessing information, the health professionals were positive stating how digital resources can be easy to use and access and reduce the likelihood of information getting lost, however this was balanced with some privacy concerns regarding who would have access to data stored online.

5.7.1. Reduction in postnatal visits

The findings show that current health professionals are providing noticeably fewer postnatal visits to new mothers compared to retired health professionals indicating a changing landscape of postnatal care. The reduction in postnatal visits could be due to several issues in current healthcare practice, including short staffing in hospital wards (Swerts et.al, 2016) and early discharge from hospital after birth placing high pressure on community midwives to be able to keep up with the demand of postnatal care (Kokab et.al, 2021). Study one highlighted that new mothers felt the focus of postnatal care was more on the baby rather than themselves when receiving home visits from healthcare professionals, however when interviewing the health professionals for the current study, particularly the midwives, they stated postnatal home visits are focused equally on the physical checks of both the baby and mother, with midwives offering more physical check-ups on the mother due to early recovery from birth. Alderdice et.al (2020) noted that mothers' lived experience of postnatal checks centred on the physical aspects with little attention being paid to the mothers' mental wellbeing. This could explain why the participants from study one explained that they felt that health professionals did not offer full support during postnatal home visits.

5.7.2. NHS postnatal care

To improve perinatal maternity services and access to postnatal care nationally, NHS England distributed the five-year plan 'Better births' report as part of the National Maternity Review (Cumberledge, 2016). The report states women should have access to their midwife postnatally to enable a continuity of care and that postnatal services are 'under resourced and over-looked' and that importance of improving access to postnatal care was a priority. Cumberledge (2016) noted in the 'Better births' report that breastfeeding support should be provided at postnatal home visits and 'rapid referral' to specialist services should be arranged for mothers who display a decline in their physical and mental health. Findings from the national maternity survey (Care Quality Commissioning Group, 2021), seen a 2% rise in continuity of care for postnatal care with a total of 30% (28% in 2019) of mothers stating they seen their same midwife from pregnancy to post birth. The percentage of mothers stating they would like to have seen a midwife more often during their postnatal care rose to 34% (compared with 25% in 2019), however, this was suggested to be reflective of disruptions to maternity services during the Covid-19 pandemic. Current NICE guidelines (National Institute for Health Care Excellence) 2021, policy states that the standard structure of postnatal care (excluding high risk women who are offered further postnatal care) involves a midwife home visit within the first 36 hours from the transfer of care from place of birth to home. A health visitor home visit is arranged between seven to fourteen days after transfer of care, and an additional GP appointment is made for six to eight weeks postnatal involving a physical examination of both mother and baby (NICE, 2021).

5.7.3. Pathways for accessing mental health support

Providing mental health support appeared to be a common goal for the midwives and health visitors interviewed, with both stating how mental health assessments would be made on expectant mothers throughout pregnancy and postnatally. Health professionals discussed structured pathways for accessing mental health support for mothers who were experiencing serious issues, however for less severe cases, access to mental health was not as well-structured or signposted from health professionals. Providing mental health support is crucial in building up a good relationship with the new mothers, however mothers often feel that health professionals are more reluctant to address their psychological needs (Megnin-Viggars et.al., 2015), this could be due to the high workload of health professionals (VanStenus et.al, 2020), and time

constraints on appointments (Swerts, et.al, 2016) highlighting a need for more effective and efficient mental health support or information provision to be provided to new mothers who are struggling.

Findings from study one and two emphasised that during postnatal visits mothers felt there was a greater focus on the assessment of the baby rather than the mother, and although the health professionals in this study stated there was equal focus on both mother and baby, specifically relating to physical checks, it could possibly be why mothers may be reluctant to open up to health professionals regarding mental health issues. Megnin- Viggars et.al (2015) reported that mothers felt health professionals focused more on baby than mother during home visits but were relieved when mental health assessment were made by health professionals. The findings from the perspective of the new mothers compared to the health professionals providing postnatal care address a need for effective communication and additional mental health assessment and support to be provided to the new mothers, providing continuity of care has shown to be effective for mothers dealing with mental health symptoms during pregnancy or postnatally and showed preferences for a single midwife offering care along the timeline of pregnancy to motherhood (Megnin-Viggars et.al, 2015).

5.7.4. Importance of relationship building and communication

As well as being important for mental health support, continuity of care was also found to be an effective way of building good relationships between health professionals and clients which often results in mothers sharing personal information easily when prompted. The health professionals interviewed stated that seeing expectant mothers throughout pregnancy encouraged successful information exchange where midwives could provide information based on the knowledge they have gained about the mother at each appointment. The retired health professionals stated this continuity was most successful when carried into the postnatal phase, however in current practice when the expectant mother gives birth in hospital, care is usually transferred to a community-based team.

Previous research has also shown that continuity of care is important from the transition of pregnancy to motherhood and that it can impact the wellbeing of new mothers (Barmani & Hylander, 2012). Perrimann, Davis and Ferguson (2018) reported that when continuity of care occurs, women gain trust in their midwife to provide information so expectant mothers can make informed decisions about labour and delivery and this results in feelings of empowerment amongst women. Continuity of

care can also lead to better birthing experiences for women due to confidence and trust gained from positive relationships with midwives throughout pregnancy (Dahlberg & Aune, 2013). However, from a midwife perspective, continuum of care can highlight some barriers and can be perceived as a difficult service to provide (Taylor et.al, 2019). Personal commitments, pressure of inflexible working patterns, work-life balance and sustainability of staff were all concerns that midwives raised when discussing the continuum of care model, most were positive towards the service being provided however putting in this into practice was spoke of more cautiously (Taylor et.al, 2019). As relationships between mothers-health professionals appear to be based on regular contact and continuity of care, this highlights a need for services to offer more efficient person-centred care that is tailored to mothers yet plausible for health professional current working arrangements.

5.7.5. Red Book and Digital information resources

In addition to being supplied information directly from health professionals throughout pregnancy and postnatal, mothers are also provided with a 'Red Book' (personal child health record) which contains written information as well as a space to record milestones and records of postnatal visits and immunisation that the infants receive. The midwives interviewed in this study spoke of having little contact with the red book however the health visitors spoke of it as being a useful tool and a 'keepsake' of information for new mothers. As findings from study one and two highlighted that digital versions of the red book and new mum journal (trialled in chapter 2) were discussed enthusiastically with mothers stating that ease of use and accessibility would be influencing factors to engage with these digital resources. The current health professionals were also mostly positive towards these digital versions stating that digital resources could lead to improved communication between themselves and their clients, and could offer safer storage of information, however, they did evoke some concerns regarding privacy and accessibility to those in lower socioeconomic areas.

A digital version of the red book (eRedBook) was trialled in the UK, with experiences of health visitors implementing this resource reiterating the barriers to distributing a digital information tool to new mothers (O'Connor et.al, 2016). Health visitors in the current study echoed those findings voicing concerns over accessibility for some mothers in communities with less access to digital technology or internet, concerns also arose over data protection and cost (O'Connor et.al, 2016), however with developed training health visitors did see this a potentially advantageous tool, drawing

on existing resources of information and the ease of use of a technology-based information source. For the findings of this study and studies one and two it is evident that digital resources of information can be useful for both health professionals and new mothers.

5.7.6. Strengths/Limitations

This study built upon the findings of studies one and two by gaining a health professional perspective of information and support that is provided to expectant and new mothers. Taking this additional perspective provides an insight into the contrasting perception of key stakeholders. Interviewing both current practicing and retired midwives and health visitors addressed areas of antenatal and postnatal support which have changed over time. The timeline of appointments gave a clearer understanding of how care is currently structured towards new mothers and highlighted pathways of how access to additional support or external services is offered. Attaining a health professionals view on potential digital sources offered insight into the advantages and barriers that providing information in digital formats may bring, this addressed a need for further examination of how current digital sources are used for accessing information during pregnancy and early motherhood. This study along with study one and two highlight that digital sources of seeking and storing information could be implemented as a useful communication tool between health professionals and new or expectant mothers, if potential barriers or concerns are assessed.

Although this study was advantageous to gaining a health professional perspective, it only explored the views of midwives and health visitors and while these professionals are most seen during pregnancy and motherhood it would be useful to gain wider perspectives from other health professionals involved with antenatal and postnatal care for example, general practitioners (GPs), breastfeeding support workers or specialist nurses. Participants from study one and two discussed having contact with other health professionals during pregnancy and postnatally therefore it would be useful to assess the views of these other health professionals involved in the provision of care to women throughout pregnancy and motherhood to examine what sources of information are currently provided and if digital resources could help to encourage information exchange.

The HCPs recruited for this study were primarily based in Northeast England, therefore findings were reflective of this region and the maternity healthcare currently

offered to perinatal women in this part of England. This was a strength of the study as the new mothers' interviews in both study 1 (Chapter 3) and study 2 (Chapter 4) lived in Northeast England therefore they highlighted their experiences of receiving perinatal healthcare in this region. Gaining a healthcare professional perspective of maternity HCPs also based in this region was useful to highlight where the discrepancies are between how new mothers perceive their care in comparison to how HCPs provide maternal care in Northeast England. Assessing the views of how digital support tools could be implemented into maternity healthcare practice in Northeast England was useful as at the time of interviewing both new mothers and HCPs digital maternity tools such as Badgernet or eRedbook had not yet been introduced. However, to expand the findings further it would be beneficial to gain a larger sample including HCPs from various regions in the UK to compare how information and support provided in the Northeast may differ to other regions. Assessing the digital information tools currently being utilised in other regions of the UK would be valuable to examine the effectiveness of such tools and how they could be implemented into Northeast based maternity practice.

5.8. Next steps

There was an apparent discrepancy between the way that postnatal visits are structured from the perspectives of new mothers and health professionals, high workload and less appointment time given to new mothers after birth could be leading to mothers feeling that postnatal appointments are more baby than mum focused. The personal child health record book (red book) is an information source given to mothers which could be useful to meet information needs during the postnatal phase, however most of the information is related to child development. Studies one and two indicated that new mothers use digital resources for information and mobile apps specifically to store personal data about their child's developmental milestones. Although some concerns were expressed around information privacy, mothers were willing to use such tools to store their personal information and experiences of motherhood, and this could potentially improve communication between mums and health professionals. In the next chapter we perform an in-depth analysis of current mobile apps aimed at pregnancy and motherhood and undertake a user review analysis to gain an idea of the functionality of such apps. Understanding what digital provision is currently available to meet mothers needs and how such resources are perceived by mothers will help identify any gaps in provision and any barriers and facilitators to use.

Chapter 6: Study 4: A review of the functionality and current users' experience of Motherhood apps

6.1. Chapter 5 recap and Study rationale

6.2. Introduction

In the previous chapter we gained a health professional perspective of information and support provided to mothers through pregnancy and early motherhood. It was evident that midwives and health visitors have a specific information they provide to mothers, however they also partake in an information exchange process with the mother as she is asked to provide personal information throughout pregnancy and postnatally. This information exchange often occurs verbally however the idea of potential digital tools to support communication was viewed positively. Health professionals stated that technology could produce safer storage of information, however this was met with some concern around privacy and digital exclusion for certain mothers. Mental health surveillance was offered to mothers both antenatally and postnatally however access to mental health support and external services proved difficult to access for mothers struggling with lower-level mental health issues. Findings also showed the changing timeline of appointments with fewer in the postnatal period. Mothers interviewed in the previous studies (study one and two) referred to the use of digital sources to meet their information needs, particularly during gaps in antenatal appointments and during periods of reduced contact with health professionals after giving birth. The use of mHealth was evident amongst new mothers who regularly spoke of the use of mobile apps during pregnancy and early motherhood to meet their information needs. It is apparent that mothers are using digital resources to meet information needs, however it is not clear as to what experience they have with digital tools (such as apps) and how such tools might encourage mothers to store personal information to share with health professionals. In this chapter a review of current mobile apps for pregnancy and motherhood will be reviewed in terms of current user experience and functionality and features they offer to new mums.

6.2.1. Mobile Health (mHealth) for pregnancy

Use of digital platforms, particularly, mHealth (mobile health) apps to seek and record information during pregnancy and motherhood have shown to be beneficial to meeting the needs of new and expectant mothers (Lupton, 2017). Features such as pregnancy tracking, connecting with others, sharing images and information on infant

development are desired by new and expectant mothers when using pregnancy/motherhood related apps (Lupton, 2017). mHealth apps for pregnancy have shown to be useful tools for expectant mothers to bond with their unborn babies (Hamper & Nash, 2021), possibly due to visual features such as comparing baby to a fruit and providing weekly updates of foetal growth. Displaying features which produce bonding effects could be advantageous to the mother's maternal health and the health of the foetus, encouraging the mother to make healthy choices throughout pregnancy (Hamper & Nash, 2021).

As well as having features that could promote maternal health, mobile apps are also being designed to assist with expectant mothers' health and wellbeing, specifically for lower-income mothers, (Peyton et.al ,2014). mHealth apps can help pregnant women to track their health and wellbeing and record diet and exercise which can be useful to reduce the chance of developing pregnancy related health issues such as gestational diabetes or excessive weight gain (Peyton et.al, 2014). As well as focusing on nutritional aspects, pregnancy apps can also be useful for self-management of pregnancy related health issues such as preeclampsia symptoms (Iyawa, Dansharif & Khan, 2021), producing further health care benefits. For physiological health tracking during pregnancy, mHealth technology has shown to be beneficial for self-management, however this could be lacking for psychological surveillance as mental health information and tracking appeared limited (Sakamoto, 2022), therefore suggested a need for stakeholders to be involved in designing supportive and informative tools to improve the mental wellbeing of expectant and new mothers.

Due to their low cost or free access, pregnancy apps are a widespread information resource amongst expectant mothers including those in lower socioeconomic areas (Chan & Chen, 2019) As shown, mHealth apps can be useful for health monitoring and self-management through pregnancy, providing quick access to information and tracking features make such apps popular digital tools. Evidence from the use of pregnancy apps as interventions to improve the health and wellbeing of expectant mothers has shown benefits such as successful control of health matters including maintaining weight, asthma control and gestational diabetes symptoms (Chan & Chen, 2019) however the effectiveness of such interventions on maternal mental health monitoring was unclear.

Although tracking and monitoring features on pregnancy mobile apps have positively influenced maternal physiological health in terms of self-management of symptoms

and a particularly useful resource for lower-income mothers, there are concerns with the efficacy of information provided on such apps that are offered free of charge or for a small cost. Apps which are distributed with no registration fee for users are often not monitored by health professionals and this poses the risk of potentially inaccurate information being provided to expectant mothers (Zimmerle, 2018). Concerns also arise around data security and privacy of information stored in such apps (Zimmerle, 2018) therefore users must be aware of accessing potential misinformation. Hughson et.al (2018) found that reliability of information provided on pregnancy apps is difficult to evaluate however they do offer the opportunity to provide expectant mothers with accurate information if health professionals are involved in the regulation of information stored on these digital resources. Often users of pregnancy apps do not examine the accuracy of information presented or raise concerns regarding data and security around the sharing of personal data relating to themselves or their child (Lupton & Pederson, 2016). It could be that the benefits of other features on pregnancy apps outweigh the issues raised however, key stakeholders must be aware of the information that pregnant women have access to when using digital sources to meet information needs.

6.2.2. mHealth apps for motherhood

As well as mHealth apps for pregnancy, some of these apps continue into motherhood and act as useful resources to provide information on child development. As maternal mental health issues such as anxiety and depression rise (Sakamoto, et.al, 2022) developing resources that can help to reduce this is essential to the health and wellbeing of new mothers. mHealth apps have shown mixed support for improving mental wellbeing of new mothers (Sakamoto, et.al, 2022) however have displayed other advantageous features such as increasing social support and tracking child development (Lupton, 2017). Mobile parenting apps include community features such as digital forums which can be a space for mothers to gain peer support and this connectivity with other women can positively influence experience of early motherhood and specific apps such as ‘Wonder Weeks’ are valued by new mothers as they can help to explain behaviour change in young children and developmental milestones to expect (Lupton, 2017).

It is apparent that first time mothers are more likely to use parenting apps compared to second time mothers (Lee & Moon, 2016), and have become an important resource for pregnancy and postnatal information. Mothers enjoy using apps for the sense of

community with other parents in an online setting. This communication can have beneficial effects on mothers' wellbeing leading to reduced anxiety from the sharing of experiences of motherhood, however this communication appears to be shared less with health professionals (Lee & Moon, 2016). As mobile apps for parenting and pregnancy and parenting do not appear to be monitored by health professional, this lack of communication could raise concern as first time mothers may be being presented with misinformation or be reluctant to seek information directly from trusted sources provided by health professionals.

6.2.3. Pregnancy and parenting app reviews

Review's assessing the quality and functions of pregnancy apps currently available have demonstrated how such apps can be useful for finding out specific information related to nutrition during pregnancy (Brown et.al, 2018, Brown et.al, 2020). A review of pregnancy apps found that 'functionality' was the highest rated feature along with weight management features, however 'information' scored lowest (Brown & Bucher, 2019). This implies a need for improvement of quality of information stored on mobile apps, whilst highlighting the risk of misinformation and the risk of expectant mothers accessing inaccurate information. Frid, Bogaert and Chen (2021) showed that only 28% of reviewed pregnancy apps cited literature, suggesting that available information on such apps may not be evidence based, however it was found that functionality and low cost or free purchase of apps were the most highly rated features. Provision of nutritional information amongst pregnancy apps appears a valued feature of mobile pregnancy apps (Bland et.al, 2019), however the accuracy of this information varies between apps.

Reviews referring specifically to apps targeted at parenting have also been shown to be rated highly on functionality and ease of use (Virani, Diffett-Leger & Letourneau, 2019). Tracking features including sleep, feeding and baby changing were common in parenting apps that had top ratings. Lupton (2016) demonstrated that tracking features relating to child growth and development milestones were also valued by parents using mobile apps, along with tracking medical information and their child's sleep patterns. It is apparent that mothers use mobile apps to gain information as well as store information about their infants, however it is unclear if such apps support mothers to share personal information about themselves or relating to postnatal recovery and mental health. Information sources are often not presented in mobile apps (Davis, et.al, 2017) therefore it is important for key stakeholders to be aware of parents being

provided with trustworthy information. and for this to be also highlighted to the parent's using the apps.

6.4. Rationale

Although apps have shown to be beneficial for pregnancy and parenting, with specific features such as tracking, nutrition information, ease of use and functionality being valued by app users, all information appears to be related supporting babies' development and specific reviews on motherhood related apps are scarce. This study will therefore aim to conduct a user review of current motherhood related apps which provide information and features related specifically to the mother as well as baby to address their features and useful functions.

This study will address the current available apps for smartphone that cover motherhood and infant development and analyse the functionality and user reviews of the apps to examine how new mothers are gaining access to information. This study will also examine, if the apps are monitored by health professionals and if they include functions for mothers to share and upload personal information.

6.5. Method and Findings

To examine the current landscape of motherhood mobile apps, a review of current available apps for motherhood and baby development on the Google Play Store. The review was undertaken to assess the common functions and usability of apps. An autoethnographic observation on mother apps was initially carried out, followed by a functionality review of these apps and finally a user review analysis. User reviews that were publicly available on the Google Play Store for each app were examined through qualitative methods using thematic analysis (Braun and Clarke, 2006), common aspects current users enjoy or dislike about the apps were coded.

6.5.1. Autoethnographic assessment of motherhood apps

6.5.1.1. Method

To become familiar with motherhood apps, a personal user perspective autoethnography was conducted on current available apps for motherhood to observe their features. Autoethnographic approaches to apps reviews have shown to be useful for identifying with user experience and highlighting useful features and have been used for examining digital wellbeing apps (Almoallim & Sas, 2022) and dating apps (Ward, 2019), however limited research has focused specifically on mobile apps for motherhood.

The aim of the current autoethnography was to examine what information and resources were available in current apps, and how easy they were to access; whilst also gaining an understanding of how the user reviews reflect the functionality of apps and what common features were most advantageous. Assessments were made on how easy to use and useful such apps were and to become aware of how other users may see potential benefits or concerns while engaging with the apps.

Motherhood (including pregnancy and parenting) mobile apps were downloaded on the researcher's Google smartphone from the Google Play store. 20 apps (see Table 7 for full list of apps) were downloaded in total, and each was used in turn for a period of 30 minutes- 1 hour to gain a sense of how such apps offered information and resources to their user's and how user friendly each app was. Notes were taken relating to the specific content of each app.

6.5.1.2. Findings

Through engaging with mobile apps for motherhood it was apparent that, the most common resources these apps offer were information and tracking features related to child development. Some motherhood apps in the search also covered pregnancy and were a continuation from this stage into early motherhood. Most apps provided information relating to infant growth, milestones and tracking for baby's sleep and feeding.

6.5.1.2.1. Monetary implications of accessing apps

To access full content of the app, most apps have a registration fee which enables users to access premium content and additional features. All apps were free to downloaded, but required users registering or creating a personal profile to use the app. The personalisation of the app allows content to be tailored towards the gestation of pregnancy or the age of a child. Features in the app were then based on this age to provide appropriate information. However, many apps included advertisements or pop-ups to encourage users to register to premium access with a subscription fee included.

6.5.1.2.2. 'That's all for now, goodbye' - Limited time frame of information

When using apps that were centred around baby development post birth, the information appeared to end after the first year of the child's life. Some apps such as Babycentre would display a message saying 'that is all for now, goodbye' to inform users that no additional information would be provided beyond this stage. Although

the apps were still usable and the ‘old’ content still available. It was apparent that apps (particularly those free to access) would only provide information for mother and baby from pregnancy to one year post birth.

6.5.1.2.3. Motherhood vs Baby information

Most apps were designed to provide information and features related to foetal and baby development, with tracking features to monitor baby’s sleep, feeding, nappy changes and developmental milestones. There was a noticeable difference between language of US based apps such as ‘What to Expect’ with terminology such as ‘Diaper changes’ and ‘Postpartum’ as opposed to UK based apps such as ‘Baby Buddy’ which would be ‘Nappy changes’ and ‘Postnatal’. Information directly relating to mothers appeared to be most apparent in motherhood specific apps such as ‘Mindful mamas’ or ‘Tinto’ where features would also include tracking mothers’ postnatal mood changes and mental health and include features to improve mothers’ wellbeing such as meditations.

6.5.2. Functionality review of motherhood apps

A functionality review of the 20 apps from the autoethnography was conducted to assess their specific features and information content.

6.5.2.1. Method

The search term ‘Motherhood’ was inputted to the Google Play Store (play.google.com/apps)

in February 2022. Terms such as parenting, pregnancy, baby development and motherhood were considered, however it was felt that the terms parenting, pregnancy and baby development would exclude the apps that were solely focused on new mums (such as Tinto, Peanut and Mamazen). Upon observing which apps were displayed with the search term ‘Motherhood’ which included those which included pregnancy, were specific to new mums, and baby development it was decided that this term would be used in the final search where apps were extracted for analysis. Exclusion criteria (See Figure 4) for apps included, not in English, no user reviews and purchase fees (Apps were included if they required registration to access app but required no subscription fee upfront, some apps included a free trial and later requested a fee to access additional content or premium version of app). A total of 20 apps were included in the review.

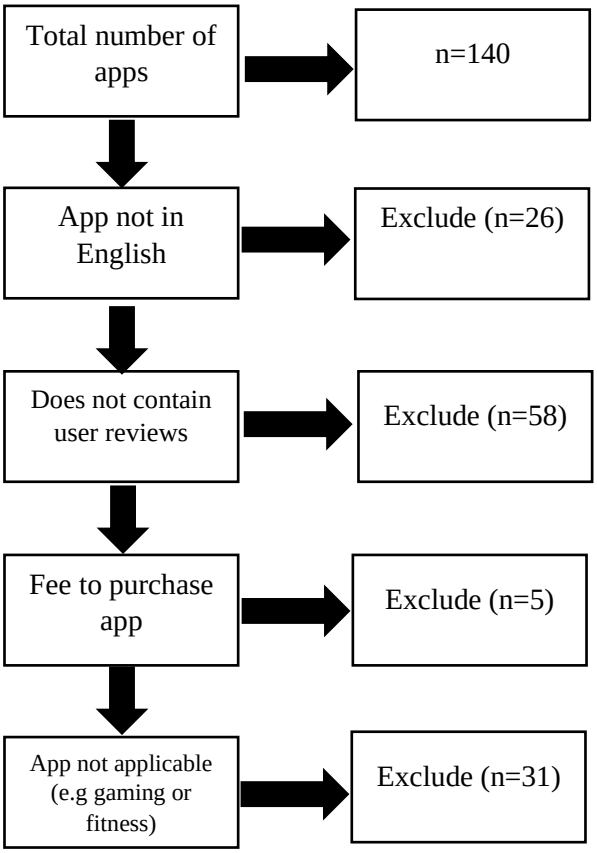


Figure 4. *Exclusion criteria for apps.*

The review consisted of making notes on the first 10 apps (Table 7) to examine their content and features. A list of features was created and how often these features appeared in each app was noted. Any apps reviews after the initial 10 were scrutinised on these initial features and if they contained anything new this was added to the list and the researcher cross checked over the initial 10 apps. A total of 20 main features were found across all 20 apps, and these were group into 7 categories which included 'Baby monitoring', 'Child information resources', 'Access and Monetary features', 'Motherhood community', 'Information for mother' and 'Health professional approval'. Features across all 20 apps were evaluated and placed into each category, then calculated to find out the total of apps which included each feature (see Table 6).

6.5.2.2. Findings

Table 6: *App features and % of apps containing features.*

Categories and App Features	Description	% of Apps including features (of out 20 Apps)
Category 1: Baby monitoring		
Tracker feature (sleep, feeding)	Baby feeding, sleeping, nappy daily tracker (for parent to input information)	11 (55%)
Storing information about baby	Feature to store photos, notes, milestones and baby growth	9 (45%)
Memories	upload photos of baby and add stickers	9 (45%)
Summary charts for baby	Graphs, charts or tables to show baby's growth, or summarising tracking features (e.g. monthly feeding chart)	8 (40%)
Category 2: Child information resources		
Daily articles	Information relating to baby	15 (75%)
Daily activities to do with baby	Activities to encourages baby development	8 (40%)
Categories for Baby, Toddler, Pre-school	Tailored information depending on child's age	9 (45%)
Podcast	Podcast feature relating to child development	2 (10%)

Online baby classes	Information provided to mothers antenatal and postnatally	10 (10%)
Category 3: Access and monetary features		
In app purchases	Fee to access additional content/ premium features	9 (45%)
Registration	Setting up a user account to access app content	16 (80%)
Offers and Coupons	Discount vouchers for mother and baby products	2 (10%)
Category 4: Motherhood Community		
Sharing content	Feature to share app content/uploaded information with family and friends	6(30%)
Community	Connecting with other mothers in forum style features	8 (40%)
Category 5: Information provision for mother		
Information specific to mother	Information relating to postnatal recovery, mothers mental and physical health	10 (50%)
Activities for mothers wellbeing	Activities such as mindfulness meditation focusing on mothers wellbeing	3 (15%)

Mood tracker for mums	Tracking postnatal mood changes	2 (10%)
Category 6: Health professional approval		
Hospital information	Local hospital information	3 (15%)
Monitoring by health and wellbeing professionals	Information approved and monitored by health professionals	9 (40%)
Category 7:		
Privacy Policy	Privacy policies to provide user information on data management.	18 (90%)

Registering and creating a personal account to access the app was evident in 80% of apps and the most common identified feature of out of the 20 apps. Most apps allowed users to make a personal profile either about themselves or their child, however mothers with more than one child could not add both children to the same profile therefore content was focused solely on the infant (from foetus in pregnancy up to one year old). Creating a profile where baby's age was inputted allowed the information to be personalised or tailored to their development stage and articles contained information such as daily articles (which was identified in 40% of the apps).

The second most common feature of reviewed apps was 'Daily articles' appearing in 15 out of the 20 apps (75%). These daily articles often referred to information covering, baby development during pregnancy and after birth, weaning for infants, health issues in infancy and immunisations to expect during the first year of a child's life. Some articles in apps such as 'Tinto' were specific to new mothers and postnatal recovery and mood symptoms, whilst also focusing on challenges a new mother may face such as sleeping and breastfeeding. Tracking appeared in 55% of the apps. Tracking features varied across apps but commonly included tracking baby's sleeping, feeding, nappy changes, activities, milestones, and growth (which included foetal growth amongst apps inclusive of pregnancy). In 40% of apps, tracking features could

be adapted into summary charts for users to see weekly or monthly changes in particular activities or child development.

It was evident that apps containing information relating to pregnancy and baby development contained more features than those specific to motherhood. In category 5 'Information provision for mother' only 2 apps contained mood trackers for mothers, which were 'Mamazen' a mindfulness- based app for mothers' wellbeing and 'Tinto' a 'wellbeing for mums' app. The feature 'information specific for mother' appeared in 50% of the apps, showing that mothers can use apps to search for information which could be useful to meet pregnancy and postnatal information needs, however being able to input and track personal information about the mother, is limited across apps. The option to share information with family and friends from the app occurred in 6 out of 20 apps, however this appeared to baby centred data such as photos or baby milestones. A 'community' feature was available in 40% of apps for new mums to communicate with other new mums on forums to share personal experiences and advice relating to motherhood.

18 out of 20 (90%) apps included 'Privacy polices' describing how user's personal data will be managed once inputted to the app. Some apps such as Kinedu include GDPR statements describing the legal basis for processing user data such as 'no data shared with third parties' e.g., (Lact App, Mush, Baby Buddy, Wonder Weeks) or 'this app may share these data type with third parties' (e.g., Mindful Mamas, Peanut, Baby+, What to Expect)

All titles of apps reviewed for the analysis are listed in Table 7 along with the percentage of outlined features they contain.

Table 7: *Motherhood apps and user ratings*

Motherhood app	**Average * rating**	**% of total features included (out of 20 identified features)**	**Total number of user reviews**
Pregnancy and Motherhood			

Glow baby tracker	4.3*	52%	12.2k
Baby centre	4.9*	31%	1m
Emma's Diary	4.2*	31%	5k
Ovia parenting	4.6*	36%	11k
Baby sparks	4.0*	26%	12k
Wonder weeks	4.5*	36%	35k
Kinedu	4.5*	52%	24k
Bounty	4.4*	31%	19k
Baby+	4.6*	63%	57k
What to expect	4.8*	52%	94k
Baby daybook	4.7*	31%	51k
Baby buddy	4.5*	57%	127
Huckleberry Motherhood	4.5*	26*	12k
LactApp (breastfeeding expert)	4.1*	31%	1k
Mindful mamas	4.6*	26%	425
Mamazen	4.6*	31%	270
Mush	3.7*	31%	1k
Peanut	4.0*	31%	6k
Tinto	4.9*	31%	223
iMumz	3.6*	42%	1k

Out of the 20 apps reviewed, the average user rating was 4.4 out of 5 stars showing a generally positive perspective on the use of apps for motherhood and the features they offer. The apps which received the highest user rating were 'Babycentre' which is both a pregnancy and baby tracker, and 'Tinto' an app for new mothers' wellbeing, both which received an average user rating of 4.9* on the Google play store. Both apps had only 6 out of 19 listed features from the functionality review, however they both provided information that was approved or monitored by health professionals.

Showing that the quality of information provided on apps might be of higher importance to users than the number of features they include.

Both apps also included the features 'daily articles' and 'community', suggesting these features were advantageous to new mothers using the apps. Provision of information approved by health professionals and information and support offered from peers (other new mother app users) in forum style settings appeared to be useful features to users. Interestingly, 'Tinto' had in app purchases to access additional or premium contact whereas 'Babycentre' was free to access and did not include this feature, however as 'Tinto' was one of the fewer apps solely focused on mothers' wellbeing as opposed to baby and child development or tracking this could explain why users were willing to accept costs to access trusted information and additional features.

The app with the lowest average user rating was iMumz with a score of 3.6*, which was a pregnancy and parenting app which included 8 out of 19 identified features from the review. Although including more features than the apps which received the highest ratings, this could suggest other factors why users may not rate the app as highly. Issues such as technical faults with the app or the content of information provided on the app may be rated less useful to new mothers than those which receive higher ratings. This was analysed further in the subsequent stage of the app review 'Motherhood apps user review analysis'.

6.5.3. Motherhood apps user review analysis

A user review analysis was conducted to assess how current users of each app rated their functionality and what features they identified to beneficial, what issues they had with app use and what improvements they suggested to improve app performance.

6.5.3.1. Method

Across all 20 reviewed apps, the total number of user reviews on the Google Play store totalled 1, 342,045. 'Baby centre' accounted for 1 million user reviews, 'What to expect' totalled 94 thousand reviews and 'Baby+' had 57 thousand reviews (As shown in Table 7). Reviews included star ratings as well as written reviews. A sample of 588 reviews were taken with an average of 30 reviews from each app. Reviews were accessed in March 2022 and dated from this time back to October 2021. Reviews were excluded from the analysis if they offered no useful information for example if they read 'Love this app', 'Excellent app' or 'Terrible app' and did not offer insight to how users engaged with using the app.

User reviews were coded if they referred to functionality of app, how the app had benefited mothers in meeting information needs or identified features which impacted the experience of pregnancy and motherhood both positively and negatively. A thematic analysis (Braun & Clarke, 2006) approach was taken to group codes into overarching themes to summarise the data.

6.5.3.2. Findings

Out of 588 reviews 403 (69%) appeared positive, where users spoke about how useful they found it and identifying enjoyable features, 131(22%) were negative, where users discussed common issues they had with functionality of the app or how they did not find the content useful. 54 (9%) reviews were mixed, some users would state some positive or beneficial features followed by problems with the app interface or fee to access additional content.

From the thematic analysis of user reviews, four main themes were identified (as presented in Table 8)

Table 8: *Identified themes from user reviews*

Theme	Description
'Expert on your parenting journey'- valued information in app	• Users described the information stored on apps as having their own 'expert' with, they valued the information provided in the apps and particularly enjoyed the daily articles and snippets of information. Users often referred to the information provided as being relevant, practical and evidence based.
Practical features- Baby vs Mother	• For apps that were based on foetal and child development, the most useful features for parents using the apps were tracking, which including sleep, feeding and milestones. The apps which specifically focused on mothers, the useful features pointed out by users were meditations to boost mothers' wellbeing

	and this was commonly met with reductions in anxiety.
Glitches in app- faults and fees	• The negative reviews commonly focused on app glitches or technical faults in app use on android phones, users would often criticise the slow running or crashing of the app. Most 'negative' reviews focused on fees for accessing premium content in the app and how this content was not valued over free content and it was reported from users as too expensive.
Improved function recommendations	• Many user reviews provided suggestions for improved or desired functions, for example a 'dark mode' feature to make the app user friendly at nighttime, alternative feeding methods for tracking such as breast-pumping, and altering development milestones for premature babies.

6.5.3.3.1. 'Expert on your parenting journey'- valued information in app

Users rated the information provided on pregnancy and motherhood apps highly, referring to the content as 'expert'. Information appeared especially useful for mothers after giving birth with a lot of it focused on child development. Users also appreciated the small snippets of information they could access daily on the app.

> *'It's pretty good, the articles come up as you need them, it really does feel like you have an expert on your parenting journey alongside, advising you. My little one is 6 months, UK based, so far so good!' (5*)*

> *'Great, easy to use app with the best deals for mothers and babies. Great place that provides information and support for new/expecting mothers and*

provides upto date details on your childs growth after birth. Fantastic competitions and special offers on what you need for your baby.'(5)*

'Lovely little bits of information every day and helpful videos'(5)*

Information on the app was also helpful to mothers own personal wellbeing, when apps contained information relating to postnatal depression and mood changes following birth this was particularly helpful to new mothers using the app.

'It also offers great articles relating to what your baby is currently going through and has a LOT of information on post natal depression. No annoying ads, simple and pleasant to look at. works 96% of the time.' (5)*

As well as specific content that appealed to users, they often commented on the information being evidence based and trusted it as they would being retrieved directly from NHS resources.

'Great app with evidence-based information from NHS midwifes, doctors and physiotherapists. Daily updates with articles, videos and links tailored to the stage of your pregnancy. Particularly enjoying the exercise videos with lots of helpful tips!'(5)*

Engaging with the content on apps, users also found themselves being proactive of recording their own personal information, keeping notes on questions to ask at later contact dates with health professionals.

'Great app to keep me updated with my and my baby's health and also encourages me to question things and keep notes on any concerns to discuss later with the midwife.' (5)*

App users which were health professionals themselves, found the content of apps such as 'Baby Buddy' a valuable information source as the content is monitored and checked by health professionals. One user commented on how they would recommend the app as a useful source from pregnancy through to motherhood.

'As I GP, I always recommend this excellent app from the first pregnancy result and onwards throughout pregnancy & new parenthood. All content has been thoroughly checked so I know to be safe & accurate. The many videos & personalised content are excellent'. (5)*

6.5.3.3.2. Practical features- Baby vs Mother

The features that appeared most useful amongst users varied for 'baby' and 'mother'. For mothers using apps, the features related to baby that occurred often in the reviews

was tracking, users found being able to track the baby's feeds, nappy changes, sleep, and development.

> *'So useful, I mainly use for tracking feeds and nappy change. Really helps especially when you're tired and brain goes to mush.' (5*)*
>
> *'Glow Baby is really a good app. As a new mother, it has helped me a lot with my daughter. Her feedings, sleeping and diaper changes.'(5*)*
>
> *'Great tracking app, has allowed us to assess our baby's development in real time, and through data analysis identify any changes in her patterns, both good and bad, without having to wonder if we imagined it (often the case when first time parents are tired and worried about their kids) or it's really there.' (5**

The tracking functions and usefulness of the app were mostly suitable for baby post birth, although some users also referred to pregnancy tracking and usefulness of the app during the foetal development phase. Users also stated that having access to a 'community' style function was beneficial, where new mothers could seek advice and support from other mums in app forum, one user mentioned that this advice from other mums cut reduce the amount of 'googling' therefore appeared to be a valued information and source of support.

> *'This app is amazing! The support I've had from people on there is astounding. If you have a baby or are pregnant, this is the app for you. There's advice from other mums and even healthcare professionals. No question is stupid, and there's always someone going through the same thing so you don't feel alone. I wish I'd found it sooner!' (5*)*
>
> *'Simple idea and it works. Reached out to real mums with a question and got some useful and detailed replies. Great community feel and no googling!' (5*)*

The apps aimed specifically at new mothers included features which were beneficial to improve mother's wellbeing. 'Mindful mamas' contained daily meditations to induce calmness to new mums. This feature was valued by new mothers who described it to be effective at reducing anxiety in the postnatal phase and encouraging new mothers to 'enjoy being in the present moment'.

> *'Mindful mamas has helped take me back to a calm state of mind... which I love being in! In a state of peace one is able to think clearer and enjoy being present in the moment.'(5*)*

‘Best app in my phone even if you're not a mother you should download this app because it just teaches you how to be a great person and how to deal with life without anxiety. I also used this app for dealing with my 56 year old mom. It's very encouraging and very useful to have in your phone.’(5)*

6.5.3.3.3. Glitches in app- faults and fees

The ‘negative’ reviews amongst users often related to glitches in the app or technical faults, which appeared to be related to not subscribing or paying a fee to access premium versions of the app. The usability and usefulness of the app was stated as limited when premium subscription plans weren’t purchased. However, some users described the app as ‘glitchy’ regardless of having subscribed and paid for additional content.

‘This app is so slow and glitchy. It takes forever to respond and multiple touches to register. I'd stop using it if I hadn't subscribed.’(2)*

‘If you don't purchase the most premium plan, the usability and usefulness of the app is severely limited.’ (2)*

Many reviews discussed that paying for premium content was not valuable as the activities or additional features were minimal. Another criticism users stated about the apps was the volume of in-app advertisements and popups, encouraging users to subscribe to premium content of the app.

‘*Useless unless you buy a subscription, it's not cheap either! If there was a one-off payment of something sensible then I might have paid for it, but seeing what activities it lists, the cost of the subscription just doesn't seem worth it.’ (1*)*

‘Great activities for you and baby, but the app is very glitchy, even when paying for the unlocked version. I didn't find it worth the download as there is minimal activities and articles available to you until you subscribe. Also every button you click an ad will pop up prompting you to subscribe for the full version, if you don't have it already.’(2)*

Though some users were willing to pay additional costs on the app to prevent ads or pop ups from appearing regularly during app use.

‘*Half the time the timeline doesn't load. Often has a pop up ad when you open the app and want to log something. Premium option is too expensive and does*

too much. I'd be willing to pay a couple dollars to not have to deal with ad spam.' (3)*

6.5.3.3.4. Improved function recommendations

Mixed reviews often occurred when users stated positive aspects of the functionality of the app, followed by suggestions for improving the app or a wish-list of features that would improve usability or usefulness of the app. Assessing the functionality of the app, many users suggested that a 'dark mode' feature would be beneficial for night time use of the app, this would particularly be useful for night feeds with baby or nap times when a darkened room was needed.

'This app desperately needs a dark mode! I use it daily to track my baby's sleep and I used it for tracking nursing when he was newborn. It really sucks getting blasted in the face with a bright screen during nighttime or even nap times when the room is dark. Please, please add dark mode as a feature! Other than that and a bit of lagging sometimes the app is great!.'(4)*

Common suggested features to improve usefulness of the app included alternative feeding methods for tracking such as breast-pumping and options to track solid foods. For babies born prematurely users suggested that milestones and development information could be altered to suit adjusted ages of the baby, as pre-term babies would not be meeting their full-term milestones so this is difficult for parents to track.

'Need a prematurity setting - ie. Babies not full term for their milestones.'(4)*

'Please please please add tracking for pumping, otherwise is great.'(3)*

'Love the app but you should also give the option to do solids instead of just bottles. My son has a metabolic disorder so I have to track all of his food, it would be so much easier just to do it all through this app.'(4)*

Ideas to improve the daily activities with baby features was apparent amongst the reviews, with users listing functions such as timers to monitor daily 'tummy time'. To track baby's health, it was also suggested that functions in app to record medications given would assist parents to monitor minor childhood illnesses.

'This app is pretty helpful. It could be better. I'd like to see this app get a timer for tummy time, and a section for recording when medications have been given for the inevitable baby colds or ear infections.'(4)*

Overall, reviews were mostly positive with users valuing the easy access to information and quality of information provided on motherhood apps. Users appeared

to rate the usefulness of apps highly though did have some issues relating to the functionality aspect, with common glitches in app reported and a reluctance to pay in app charges for additional content. Users who enjoyed using the app content made useful suggestions for additional functions to improve usability of the app to appeal to wider audiences such as mothers with premature babies or children with health conditions.

6.6. Discussion

The aim of this study was to assess the functionality of currently available motherhood apps and to examine how users evaluate the apps in relation to their experiences of motherhood. The findings show that most features are focused on providing information to mothers and from a user perspective this access to information is the single most useful aspect of the app.

Storing personal generated data appeared to be more relevant for information regarding the baby for example tracking their development, feeding, sleeping patterns, and milestones, and fewer features were available for mothers to record their own personal data. Accessing information appeared to be a well-received function of motherhood apps and having quick and easy access to information could be beneficial to mothers specifically when gaps occur in the provision of care from health professionals in the pregnancy and particularly postnatal phase.

6.6.1. Information centred Apps

The information aspect of these apps was noticeable with user reviews of motherhood apps highlighting information as an important feature, especially regarding child development, or to track information relating to their child. The findings of study 1 and 2 along with previous studies (Peyton et.al, 2014), revealed that many information gaps occur both antenatally and postnatally, where access to health professionals is limited mothers often use digital information sources to meet their needs. The use of apps as information tools could be advantageous for the gaps in care, particularly in the postnatal phase where mothers feel the continuity of information provision and support directly from health professionals following pregnancy is lacking (Ollander et.al., 2019). and home visits are reduced. Features relating directly to mothers were well liked, however did not appear to be very interactive and were generally lacking across apps.

Tracking features included in the mobile apps were mostly baby centric and consisted of inputting information about baby’s sleep schedule, tracking nap times and waking

hours of the baby, feeding schedules, including breastfeeding, bottle feeding, timing between feeds and duration of feeds. These features were evaluated positively by users. This supports previous research by Lupton (2017) who found that tracking features have shown to be useful for new mothers using mHealth tools. Most apps included functions to create weekly or monthly charts summarising this data so users can visualise the sleep or feeding patterns of their babies. The user reviews showed that often this tracking data could be shared with health professionals during appointment times or encourage parents to write down any questions or concerns they had based on their baby's development, however the apps did not appear to include functions where information could be shared directly with health professionals.

Communication with health professionals did not appear to be a provision in current motherhood apps, rather acting as a prompt to encourage information sharing between new mothers and health professionals. The tracking features and information provision amongst apps were mainly aimed at the needs of the infant and fewer features were available for the mother to input personal generated data and specifically postnatal symptoms, particularly for apps which covered pregnancy and motherhood. Amongst the apps which were specific to motherhood, some included useful information relating to postnatal depression according to user reviews and few apps included mood tracking, generally motherhood specific resources were minimal. This aligns with findings from studies 1 and 2 where mothers spoke about a lack of motherhood specific resources. Study 2 highlighted the benefit of a mum specific journaling tool and demonstrated the benefits on journaling for motherhood such as offering a space for self-reflection and improving wellbeing. The apps reviewed in the current study displayed a lack of journaling features, however the content aimed at improving mothers' wellbeing was valued by app users.

6.6.2. Accessing support for mothers via apps

Some reviewed motherhood apps, particularly those tailored towards mothers' wellbeing, were useful in providing information relating to postnatal depression and included helpful features such as mood trackers (MamaZen and Tinto), however apps were generally limited in providing mental health support to the mother. Mixed support from previous research has shown how the use of mHealth resources can benefit new mothers' wellbeing (Sakamoto et.al, 2022), the role of self-management and social support from mHealth use has shown to have positive effects on improving mothers' wellbeing.

Focusing on mothers' mental health produced mixed support (Baumel, et.el, 2018; Sakamoto et.al, 2022). An app which included self-help tools and emotional support from volunteers did not appear to be effective in improving mothers' symptoms of anxiety (Baumel, et.al. 2018) however it was reported that the use of a two-way text messaging service between health professionals and mothers to provide health information was effective in reducing depressive symptoms amongst mothers (Song et.al, 2013). In the current app review, users rated apps that were monitored by health professionals and provided evidence-based information highly, this could also produce positive effects on mothers' mental wellbeing. This supports previous findings which demonstrate the need for information to be provided directly from health professionals to mothers along with professional advice and support is valued by new mothers (Lupton, 2016). In line with findings of study 2, this suggests that a journal style digital tool that could be shared with health professionals could result in better access to information as well as maintaining a positive relationship between health professionals and new mothers.

As well as rating evidence-based information provided on motherhood app, community features, (including app forums) were also well regarded by new mothers and appeared to be beneficial to mothers' wellbeing. User reviews indicated that social support was prevalent amongst apps and being able to connect and seek advice with other new mothers acted as positive features of the apps. Connor et.al, (2018) found that community features amongst mHealth apps could increase feelings of social support amongst new mothers which could result in improved mental wellbeing. Support has also shown to come directly from apps, Sakamoto et.al, (2022) reported on findings of apps acting as a supportive tool for infant mothers during night-time feeds having the ability to access advice from other mothers at any time.

6.6.4. Reflecting on barriers to App use

Despite previous research stating that mHealth apps raise privacy and security concerns (Zimmerle,2018) including both the accuracy of information provided on apps and the privacy of personal data stored in apps, this did not appear to be a prevalent issue from the current user reviews. User reviews did refer to valuing information provided on apps which was monitored by health professionals, however the functionality review showed that only 40% of apps were monitored by health professionals so potentially risk including inaccurate information. Previous research has also shown that health professional monitoring of apps is relatively low (4 out of

10 apps) (Scott et.al., 2015), which included being developed with health professional involvement and including evidence-based information. Hughson et.al. (2018) also specified that if health professionals are involved with regulation of information on apps for motherhood and pregnancy this presents an opportunity for mothers or other apps users to be provided with accurate and trustworthy information.

As highlighted in study 3, health professionals are ideally positioned to refer new and expectant mothers to trusted evidence-based information and take care to notice potential misinformation that their clients may be accessing from using online information sources.

Concerns from an HCP perspective regarding app use for new mothers was not the accuracy of information, rather the accessibility and inclusion for mothers in lower socioeconomic areas who have less access to internet or digital resources. Given that many of the apps contained premium paid for features this concern over disparities in access to information remains a concern. Study 2 findings suggested that an app based 'mum journal' could have potential privacy and security issues, new mothers flagged concerns over how safe their personal would be stored in an online capacity, however the current user reviews did not appear to flag this issue and appeared to enjoy the features of the app where storing personal data was permitted, for example the tracking features. Some apps (45%) also included features to share photos and personalise the app, however evaluating the user reviews, this did not appear to be a concern and users generally viewed the apps as safe to use, and rather focused on other app issues such as fees for accessing content and app glitches.

6.6.5. Strengths/Limitations

This study provided an evaluation of solely motherhood focused apps as well as pregnancy apps, whereas previous literature has mainly concentrated on pregnancy app reviews. Assessing what provisions and features are currently available on apps for new mothers and how this may impact their wellbeing and mental health. The autoethnographic aspect of the review allowed personal first-hand experience of current apps from a researcher perspective to assess their content and features. Containing a user review analysis allowed the functionality review to show which exact functions and features adds to the perceived usefulness of an app and highlighted benefits and negatives to the apps in relation to ease of use and accessibility.

However, although emphasised by users that accessing premium content and paying fees to have full use of apps was rated negatively, the autoethnographic review did not

fully explore these additional features or access premium content. Therefore, this aspect of the review was only based on the basic content of the apps for motherhood, assessing full features of the app including premium content would be beneficial to explore further functions of apps to examine their full content. A second limitation of this review acknowledges current technology advancements and therefore new apps could be currently developed that were not included in this review, the evolving nature of digital resources would mean that this review would be lacking longitudinal findings. However, this does pose a good opportunity for follow up app reviews to assess the most recent apps being developed for motherhood and encourages the prospect to also examine accessibility and inclusion for apps to ensure that all new mothers have access to these resources.

6.7. To the final study

As shown in this current app review, features amongst motherhood apps are greatly focused on baby development and less focused on the mother. Tracking features for baby can be used as prompts to share this information with health professionals however few apps contained features for mothers to track their own personal information, for example postnatal mood and physical recovery from birth. As self-reflection has shown to be an important aspect in mothers wellbeing, creating a tool to enable mothers to partake in tracking, self-reflection and sharing this information or experience with health professionals could be very useful to improving mothers physical and mental wellbeing. Sharing this information may also enhance the relationship and communication between new mothers and health professionals.

The final study will involve designing a concept app aimed at new mothers based around journaling and recording both information specific to mum and baby to enable this information to be shared with health professionals. A mock app design will be presented to mothers to assess the key predictive factors in intention to use such an app and gain thoughts around its potential usefulness.

Chapter 7: Study 5: Predicting use of a digital information tool for motherhood using the Technology Acceptance Model

7.1. Chapter 6 recap and study rationale

The previous chapter demonstrated how current available apps for motherhood are rated from a user perspective relating to their features, functionality, and usability. Finding showed that accessing information from the app was the most beneficial feature of motherhood apps and the provision of information in small easily readable snippets was valued by users. Generally, users trusted the accuracy of information, however, they did raise concerns regarding the privacy and security of app use, particularly when using apps to store personal generated information. Mothers rated the usefulness of the apps positively as most included tracking features (such as feeding, sleeping and baby milestones) and how storage of such information enabled easier access to encourage information sharing with health professionals. However, apps displayed lack of focus directly towards the mother. Features (on general pregnancy apps) allowing mothers to input personal information relating to their pregnancy or postnatal recovery were lacking, as was information directly aimed at new mothers' mental health. Few apps were directly aimed at new mothers specifically, however, these apps were seen as beneficial towards improving mothers' wellbeing, given the particular emphasis on mother allowing focus on personal wellbeing. This echoed findings from study 2 which also showed that new mothers valued the opportunity to record information relating to their own postnatal recovery and maternal wellbeing alongside their baby, which helped mothers particularly when coping with postnatal mental health struggles. It is also worth noting that a few apps did include a community style feature where women could connect with each other and seek experiential support. Given the importance of information provision on motherhood apps, value of experiential support and the potential of improved communication between perinatal women and healthcare professionals, this chapter explores the potential of an app designed to encourage mothers to record both their own and their baby's personal information in a digital journal to support self-reflection and monitoring of new mothers mental health and wellbeing combined with the valued features of tracing baby's development.

7.2. Introduction

Digital technology for motherhood has been examined throughout this thesis, mothers from study one and two demonstrated a reliance on digital resources for example the (internet and social media) to extract information and seek support relating to the perinatal stage due to limited information and support provided by healthcare professionals (HCPs) during this stage. The findings from each chapter have highlighted the need for additional support to postnatal mothers, as it has been apparent this stage is where mothers are most vulnerable, seek the largest adjustment to motherhood and experience many physical and mental changes. However, postnatal mothers are generally met with reduced contact with HCPs and transition between various HCPs (for example practice based maternity team to community team). Mothers also perceive a greater professional focus on the wellbeing of their newborn baby as opposed to themselves during postnatal home visits and appointments with HCPs. From exploring a paper-based journal, participants from study two described how a resource to input personal generated data and encourage self-reflection on motherhood experiences could prompt new mothers to share more personal information with HCPs which could positively impact the relationship and communication between themselves and postnatal HCPs. Although new mothers enjoyed many features of the paper-based journal, a digital version of this journal was viewed in a positive light, allowing quick and easy access to information management whilst being active with a newborn baby. Combining the findings from previous studies in this thesis, the need for an app designed with new mothers front and centre to allow tracking of mother's health wellbeing alongside baby is now suggested.

7.2.1. Technology use in UK maternity services

As outlined in chapter 2, literature review; UK maternity services have seen the implementation of a digitalised personal child health record book named previously named the 'eRedbook' (previously 'Red Book') (NHS, 2020), which is downloadable as a mobile app. Research findings relating to efficacy of the eRedbook and the acceptance by parents has been limited, however, research has suggested that the digitised child health record could help to improve communication between parents and HCPs (Moulin,2016). O'Connor et.al, (2016) found that amongst parents and health professionals, use of the eRedbook flagged concerns around access to the app (health visitors having to register parents to the online document); safety issues

concerning where the child's data would be stored; digital inclusion and the digital divide for families who do not have access to technology and the internet; and health literacy surrounding how knowledgeable health visitors are with using the technology required for successful implementation of the eRedbook. When asked about potential eRedbook use, mothers in chapter 4, study 2, stated that the digitisation of the child health record book could prompt communication between themselves and HCPs as the information stored in the mobile app would be easily accessible to track their child's health and readily available during home visits and appointments to share with HCPs. Mothers (study 2) also stated how a combined digital version of a motherhood journal with features of the eRedbook to track their child's health would be beneficial to keep information in one source to ensure ease of use, although mothers were cautious around privacy and who would have access to their personal information.

Use of technology-based tools to improve communication between perinatal women and HCPs could have beneficial effects on their relationship, specifically for postnatal mothers who have shown the importance of building positive relationships with HCPs to gain information and support (Finlayson, Crossland et.al, 2020). Although a time when women seek the most support (Henshaw et al, 2018), the postnatal phase has shown to be the stage of motherhood where women feel most vulnerable, dealing with the transition of health care professionals from pregnancy to labour then post birth and a time where information needs are largely unmet (Ollander et al, 2019). As women are introduced to new postnatal health care professionals, support tools which help to build effective communication between women and HCPs and encourage women to feel a greater sense of support during this stage could be beneficial to the wellbeing of postnatal mothers. As part of the NHS 'better births' five-year plan (NHS England, 2016) digital strategies have been implemented such as a the Badgernet app (digitalised pregnancy and postnatal medical notes) to aid in the improvement of communication between mothers and HCPs however, findings which show the effectiveness of this app are relatively lacking.

Previous literature has identified a heavier focus on the health and wellbeing of the baby during early postnatal contact with HCPs (McCleish et al., 2020) and the state of the 'invisible mother' (Devries, 2017) where many postnatal mothers feel less supported by HCPs from giving birth to postnatal recover. Based on findings from previous research and this thesis thus far, it is apparent there is an opportunity to

provide support for new mother's wellbeing to improve alongside their relationship with their postnatal healthcare providers. The final study will propose a motherhood focused technology support tool which aims to provide a platform where mothers can focus on tracking their own personal physical and emotional recovery from birth and caring for their baby.

7.2.2. Technology acceptance model (TAM)

The Technology Acceptance Model (TAM) (Davis, 1989) is a theoretical modelused to predict user acceptance (intention to use) and attitudes towards technology systems based on perceived usefulness ("the degree to which a person believes that using a particular system would enhance his or her job performance, Davis, 1989) and perceived ease of use ("the degree to which a person believes that using a particular system would be free of effort", Davis, 1989). Full TAM model outlines in Figure 5. The TAM has been used in health informatics and has shown to be successful in predicting outcomes of use of electronic health records (Rahimi et. al., 2018) and mobile health apps for personal medical record use (Mohammed et al., 2011). It was found that using an extended TAM model, acceptance of mobile health apps highlighted that a 'well informed' technology design made users more accepting of the technology and increased intention to use it; perceived usefulness of the mobile health app was the strongest predictor of mobile health apps over perceived ease of use (Mohammed et al., 2011).

Use of the TAM also extended to other areas of health including acceptance of health information technology (HIT) amongst health professionals (Ketikidis, 2012). Findings showed from the core strands of the TAM, perceived ease of use predicted HIT usage amongst health professionals however perceived usefulness did not and an extended TAM model found that job relevance was also linked to HIT usage amongst HCPs (Ketikidis, 2012). Using TAM to predict women's intentions of using the internet to seeking health information showed that perceived usefulness and attitudes had the biggest impact on using the internet as a source of health information (Ahadzadeh & Sharif, 2017). Although assessed in areas of health, the TAM has not been specifically examined with use to pregnancy and motherhood related technology sources such as mobile apps to examine what factors would increase likelihood of intention of use. Therefore, the current study aims to address this by proposing an

extended TAM model to investigate predictors of use of a technology support tool for new mothers.

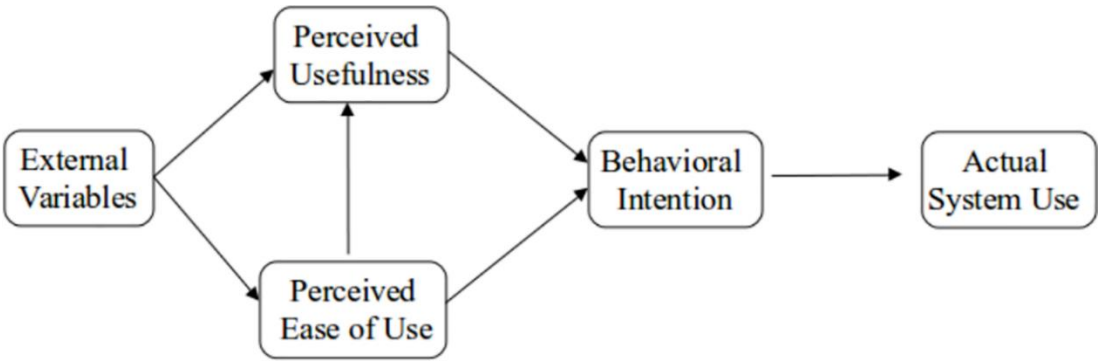


Figure 5: *Technology* Acceptance *Model*

To examine an extended version of the TAM in relation to healthcare practice, Velicia-Martin et al (2021) investigated intentions to use a concept Covid-19 app using an extended version of the TAM which included predictors: perceived usefulness, perceived ease of use, attitudes with additions; trust, privacy and perceived risk of Covid. It was found that original predictors of the TAM (perceived ease of use, perceived usefulness and attitudes) were successful in predicting intention to use a concept Covid-19 app, along with trust and perceived risk of Covid however, privacy concerns did not significantly predict intention to use the app (Velicia-Martin et al., 2021).

The current study aims to adopt the methodology of Velicia-Martin et al., 2021 using an extended TAM looking at intention to use a concept design of a combined motherhood and baby app with predictors including perceived usefulness, perceived ease of use, attitudes along with extended predictors used by Velicia-Martin et al. (2021) included trust and privacy concerns. As shown previously by Velicia-Martin et.al. (2021), the motherhood app will be concept based, rather than fully operating app, therefore aspects of the TAM will be examined through perceptions of the app rather than experience of using the app. However, TAM categories previously assessing the concept Covid-19 APP found perceived ease of use to be predicted through presenting an app which was not fully operational. As previous research along with further findings identified throughout this thesis have highlighted the importance of healthcare professional support for new mothers (McLeish et al., 2020) along with

social support (Emmanuel et al., 2012), the current study will propose a further extended TAM to include the predictors of HCP support and social support as predictors of intention to use a new motherhood app. HCP support is expected to positively predict intention to use the app, as the motherhood app could act as a prompt to improve communication between mothers and HCPs therefore this should encourage intention to use the app. High levels of social support should also positively predict intention to use the app due to family and friends encouragement for mothers to reflect on their own personal wellbeing in the early postnatal stage. Although other potential models were considered to examine the intention to use a new app for motherhood based on a concept design, such as Theory of Planned Behaviour (TPB) (Ajzen, 1991) which similarly to TAM presents three main components including Attitudes, Social norms and Perceived behavioural control to predict intention and behaviour. Both have shown to be robust empirical models in predicting intentions and behaviours (Matheison, 1991), TAM is 'easier to use' due to its standardised components as it does not explore social influences and control as TPB does therefore it is potentially a more efficient model to use. TAM was the chosen model for this study based on the ability to adapt and extend the model and based on previous research which have demonstrated how the model could successfully predict intention to use a new mobile app (Velicia-Martin et.al., 2021). Although the link between intention and behaviour has presented a gap (Sheeran, 2002) as models such as theory of planned behaviour can successfully predict intention to perform a behaviour, it is often unclear as to whether this can fully predict behaviour due to extraneous variables however predicting behaviour from intention can be successful when goal setting occurs (Sheeran, 2002). For the current TAM model, as the presented app will be concept based and not a fully working prototype, the intentions, and attitudes towards potential use of the app will be examined in this study.

Extended model of the TAM for the current study proposed in Figure 6.

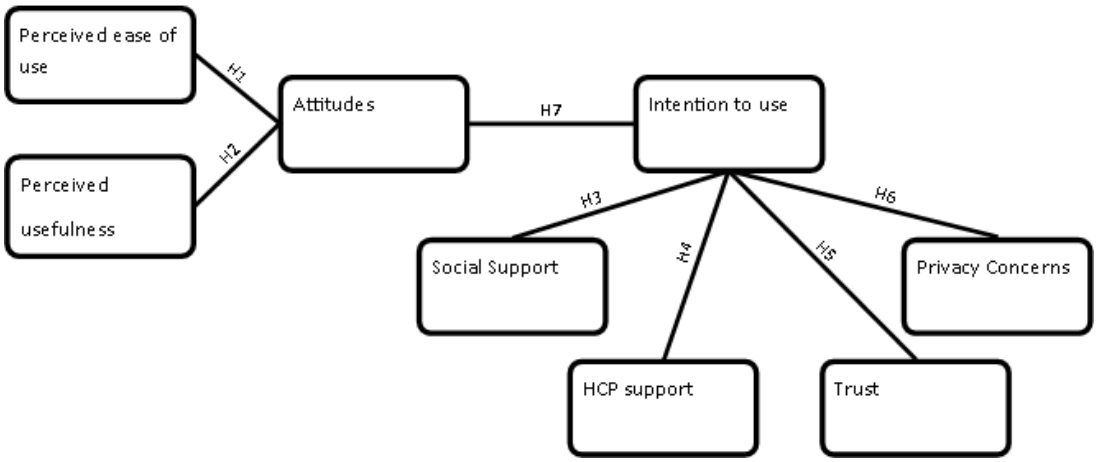


Figure 6: *Extended TAM model*

7.2.3. Aims and Hypothesis

This study will use a survey methodology to understand predictors of intention to use digital services for new mothers (a new app centred around information storing and sharing). The aims of the current study are to investigate the proposed extended TAM model in predicting intention to use this new concept app for mothers. Based on previous literature and findings from this thesis, the expected outcomes of this study are as follows:

Hypothesis 1 (H1)- The perceived usefulness of the app will significantly positively predict intention to use

Hypothesis 2 (H2)- The perceived ease of use of the app will significantly positively predict intention to use

Hypothesis 3 (H3)- Health professional support will significantly positively predict intention to use

Hypothesis 4 (H4)- Social support will significantly positively predict intention to use

Hypothesis 5 (H5)- Trust concerns will significantly negatively predict intention to use

Hypothesis 6 (H6)- Privacy concerns will significantly negatively predict intention to use

Hypothesis 7 (H7)- Attitudes towards the app will significantly positively predict intention to use

7.3. Method

7.3.1. Design

A cross sectional online survey design was implemented for this study. Predictor variables included perceived ease of use, perceived usefulness, attitudes, trust, privacy, HCP support and social support. The outcome variable was behavioural intention.

7.3.2. Participants

Participants were selected using a purposive sampling method. A recruitment advert (Appendix 12) containing a link to the survey on the Qualtrics platform was advertised via social media (Instagram, Facebook and WhatsApp), local mother and baby groups in Northeast England, and an online recruitment platform Prolific (https://www.prolific.co/). N=50 participants were recruited via Prolific and were paid a small payment (<£3, as informed by Prolific) for taking part in the survey. New mothers were invited to take part in the survey if they had recently become a new mother (had a child under the age of two), this was to ensure that experiences of early motherhood had occurred recently so new mothers could accurately state whether they would intend to use an app designed for postnatal mothers. Participants recruited via Prolific were UK based but not specific to the Northeast region. N=163 respondents were totalled on the Qualtrics survey platform, however due to incomplete responses a total of n=102 participants data could be used for analysis. Participant demographic information such as if mothers age, age of their child and if they were a first- or second-time mother was collected (see table 9). All participants were assigned to the same sample group.

Table 9: Additional participant information

		n
Mothers age	18-24	6
	25-34	68
	35+	26
First or Second time mother	First time	53
	Second time	47
Child age	0-6 months	21
	6 months- 12 months	19

	12 months- 18 months	32
	18-24 months	28

7.3.3. Materials

Prior to completing the survey, participants were provided with a vignette. This was developed to give participants a scenario of the prospect of a new mother would use the motherhood app in daily life, how information could be stored on the app and how this could be a prompt to share information with HCPs to encourage communication and information exchange between mothers and postnatal healthcare providers.

A concept app was designed to provide a visual to participants of how the app may look aesthetically and what features the app may contain relating to how mothers could store information about themselves in an 'online journaling' feature, along with how information about baby could also be inputted and included the popular tracking features highlighted as a beneficial feature from study 4. Figure 7 shows the concept design of the motherhood app. The design of the app was based on the 'New mum journal' (Study 2, Chapter 4), apps reviewed in study 4 (Chapter 6) and elements of the eRedbook. The concept was designed to be visually appealing as previous has shown how credibility and trustworthiness of mobile apps can be assessed based on aesthetic (Bussone et.al., 2020). The app was designed to be easily navigated with clear sections for new mothers to use the digital journal and tracking features. Participants were able to view two screens on the app (shown in Figure 7), showing the sections for journaling, designed to be filled with short accounts of motherhood experiences, and tracking baby specific activities such as feeding and sleeping.

Vignette used in survey:

"We are interested in understanding more about how mothers feel about technology use for accessing and sharing information about 'Motherhood'. Please consider the following scenario: Anna is a 28-year-old new mother to a 6-week-oldbaby. Anna has downloaded a 'New Mum Journal App' onto her mobile phone which has been designed specifically focusing on motherhood. The aim of the app is to provide a space for new mothers like Anna to record their information about their postnatal recovery and symptoms, mood, and daily experiences of being a new mum. Anna can upload photos of her new baby and activities they do together whilst also keeping track of her baby's milestones. Acting as a new mum's journal, Anna uses the app to reflect on

issues such as postnatal mental health, physical birth recovery and any concerns she has, whilst also recording activities and experiences she has being a new mum. Anna uses the app as both an information resource and as a tool to prompt conversations between herself and health professionals relating to her motherhood journey and caring for her newborn child”

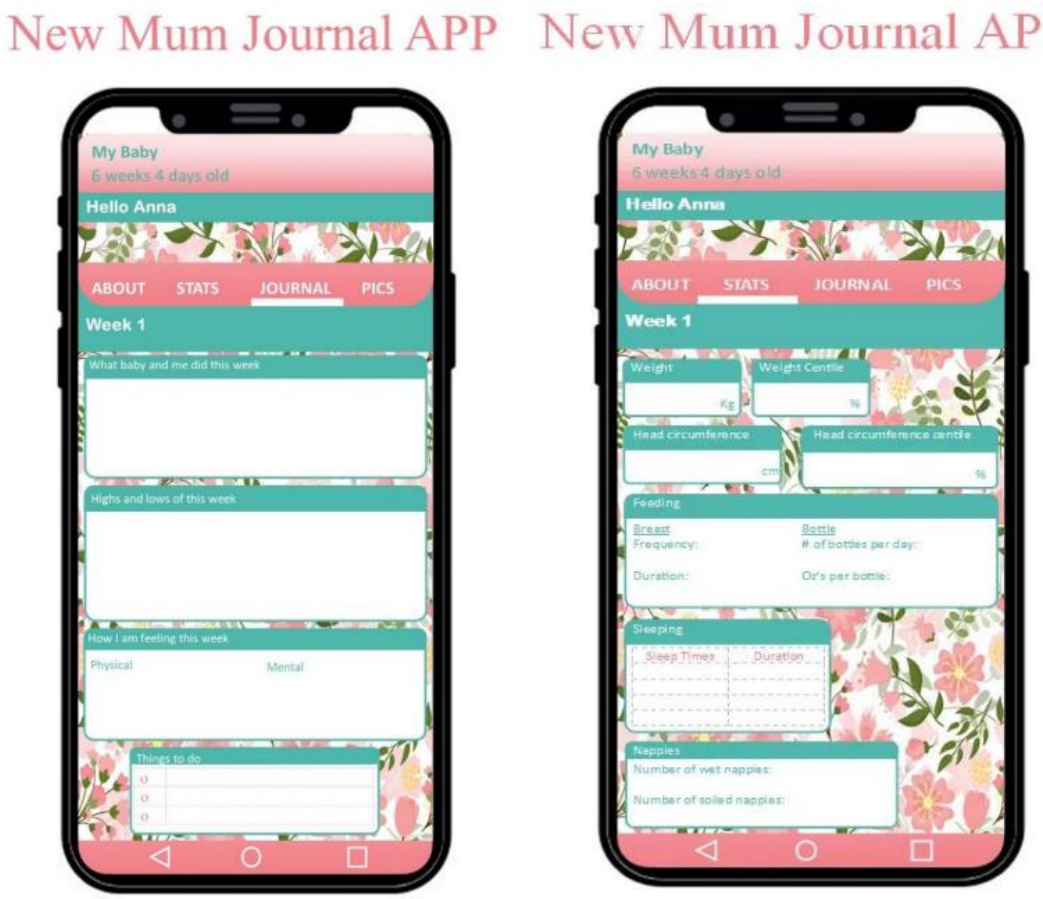


Figure 7: *Concept design for motherhood app*

A 40-item (Appendix 14) questionnaire was developed to test the proposed extended TAM model proposed for this study. Items related to perceived ease of use, perceived usefulness, privacy, attitudes, trust and behavioural intention were adapted from the proposed scale by Velicia-Martin et al (2021), however altered to be applicable to motherhood. Validated scales were used to examine healthcare professional support and social support.

The original scale developed by Velicia-Martin et al. (2021) to test the proposed extended TAM on intention to use a Covid-19 app consisted of 25 items. 21 items (excluding those directly linked to Covid-19) from this scale were developed for the current study. The remaining 19 items consisted of the 'Mother Perceived Professional Support Scale' which was comprised of 7 items to assess how new mothers perceived their experiences of postnatal care delivered by healthcare professionals. The 'Multidimensional Scale of Perceived Social Support' was an additional 12 item scale to assess new mothers' perceptions of support which included family and friendship

and intimate partner relationships. The questionnaire was designed to firstly present the items related to the original TAM model (Perceived usefulness, perceived ease of use and intentions) followed by the additional items of Trust and Privacy presented by Velicia-Martin et.al., (2021). Finally, the items proposed in the extended version relating to HCP support and Social support were presented.

7.3.3.1. Perceived ease of use (PEOU)

To measure perceived ease of use as a predictor of behavioural intention, a 4 items scale was used with questions including: 'I think the interaction with the App would be clear and understandable'. Each item was measured on a 7-point Likert scale where '1'=Strongly disagree, '4'= neither disagree or agree to '7'= Strongly agree. Minimum score possible was 4 which would indicate a low level of PEOU which should lead to less intention to use the motherhood app. Maximum score possible was 28 which would indicate the highest-level PEOU which should result in high behavioural intention of app use. Cronbach's alpha reliability testing for the Perceived ease of use scale indicted good internal consistency of items ($\alpha = .82$). (Full scale and output in Appendix 13 and 14).

7.3.3.2. Perceived usefulness (PU)

To measure perceived usefulness as a predictor of behavioural intention, a 4-item scale was used with questions including 'I would find it useful to have an App that allows me to store my personal experiences of motherhood and postnatal recovery'. Each item was measured on a 7-point Likert scale where '1'=Strongly disagree, '4'= neither disagree or agree to '7'= Strongly agree. Minimum score possible was 4 which would indicate a low level of PU which should result in low behavioural intention to use the app. Maximum score possible was 28 which would indicate the highest prediction of PU to behavioural intention of app use. Cronbach's alpha reliability testing for the Perceived usefulness scale indicted excellent internal consistency of items ($\alpha = .91$). (Full scale and output in Appendix 13 and14).

7.3.3.3. Trust

To measure trust as a predictor of behavioural intention, a 3-item scale was used with questions including 'This App would take into account the interests of its users'. Each item was measured on a 7-point Likert scale where '1'=Strongly disagree, '4'= neither disagree or agree to '7'= Strongly agree. Minimum score possible was 3, the lowest score on this scale would indicate high trust concerns with the app which should lead

to low prediction of behavioural intention. The maximum score would be 21 which would indicate high trust issues with the app which should result in low intention to use. Cronbach's alpha reliability testing for the Trust indicted good internal consistency of items (α = .81). (Full scale and output in Appendix 13 and 14).

7.3.3.4. Privacy Concerns

To measure privacy as a predictor of behavioural intention, a 4-item scale was used with question including; 'I am concerned that someone else may find out private information about me'. Each item was measured on a 7-point Likert scale where '1'=Strongly disagree, '4'= neither disagree or agree to '7'= Strongly agree. Minimum score possible was 3, the lowest score on this scale would indicate low privacy concerns with the app which should predict high intention to use the app. The maximum score would be 28 which would indicate high privacy concerns with the app and low intention to use. Cronbach's alpha reliability testing for the Privacy Concerns scale indicted excellent internal consistency of items (α = .94). (Full scale and output in Appendix 13 and 14).

7.3.3.5. Attitudes

To measure attitudes as a predictor of behavioural intention a 3-item scale was used with questions including 'Its use would be positive for my life'. Each item was measured on a 7-point Likert scale where '1'=Strongly disagree, '4'= neither disagree or agree to '7'= Strongly agree. Minimum score possible was 3 which would indicate low positive attitudes towards using the app which should therefore result in low prediction of behavioural intention to use the app. The maximum score was 21 which would indicate highest level of positive attitudes towards the app therefore should predict high behavioural intention to use the app. Cronbach's alpha reliability testing for the Attitudes scale indicted good internal consistency of items (α = .86). (Full scale and output in Appendix 13 and14)

7.3.3.6. Behavioural Intention

Behavioural intention was the outcome variable and measured on a 3 items scale with questions including 'I would try and use this App in my daily life'. Each item was measured on a 7-point Likert scale where '1'=Strongly disagree, '4'= neither disagree or agree to '7'= Strongly agree. Minimum score achievable was 3 which would indicate lowest intention to use the motherhood app, and the maximum score was 21 which would indicate the highest intention to use the motherhood app. Cronbach's

alpha reliability testing for the Behavioural intentions scale indicted excellent internal consistency of items (α = .94). (Full scale and output in Appendix 13 and 14)

7.3.3.7. Healthcare professional support

To assess the impact of HCP support on intention to use the motherhood app, the 'Mother Perceived Professional Support Scale (MoPPS) (Thortensson et a.l, 2015) scale, designed specifically to examine new mothers' experiences with healthcare professionals support received during the postnatal period, was used. A 7 item, 7-point Likert rating scale whereby '1=Strongly agree- 7=Strongly disagree' was used and included statements such as 'Thinking about the health care professional you saw most recently in relation to motherhood e.g. (midwife or health visitor); They were sensitive/understanding/supportive. Minimum score achievable for this scale was 7 which would indicate lowest perceived levels of HCP support and the maximum score for this scale was 49 which would indicate high perceived levels of HCP support. Cronbach's alpha reliability testing for the MoPPS scale indicted excellent internal consistency of items (α = .93). (Full scale and output in Appendix 13 and 14).

7.3.3.8. Social support

To examine the impact of social support on behavioural intention to use a motherhood app, the validated scale 'Multidimensional Scale of Perceived Social Support (MSPSS)' (Zimet et al., 2010) was used in the survey. The MSPSS is a 12 item, 7-point Likert rating scale whereby '1=Strongly agree- 7=Strongly disagree' with sub scales of statements relating directly to either family friends such as 'I get the emotional help and support I need from my family' and 'I have friends with whom I can share my joys and sorrows'. Minimum score possible for this scale was 12 which would indicate low perceived social support and maximum score for this scale was 84 which would show highest level of perceived social support. Cronbach's alpha reliability testing for the MSPSS scale indicted excellent internal consistency of items (α = .89). (Full scale and output in Appendix 13 and 14).

7.3.4. Procedure

Participants were provided with a link Qualtrics survey via social media or using the recruitment panel Prolific. Participants were initially prompted to read an information sheet and consent form and requested to provide electronic consent ('I agree'). Participants were then asked to input a memorable code word so their data can be identified anonymously. As part of the survey, participants were firstly presented with

a vignette outlining a new mother using the concept app and stating how this could act as a tool to encourage communication and information exchange with HCPs (full vignette provided in Appendix 13). An image of the concept motherhood app design was shown to participants who were asked to keep this app in mind whilst answering the 40-item questionnaire. Participants were then prompted to respond to each question related to each outlined predictor of intention to use the concept app. Once participants had completed the rating scales, they were asked to provide qualitative feedback on 'thoughts about the app'. The qualitative data was inputted to NVivo software and a thematic analysis (Braun & Clarke, 2006) was conducted to create themes to compare against the quantitative findings from the survey. Those recruited via Prolific were paid a small reimbursement for their time. All participants were presented with a study debrief upon completion of the study. The full survey took approximately 15 minutes in total to complete. Data collection for the survey occurred between June 2022 – September 2022.

The study received ethical approval from Northumbria university ethics committee (ref: 45985). GDPR requirements were adhered to throughout the study. Participants were only required to provide information including their age, child's age and whether they are a first- or second-time mother. No other personal data from the participants was required for the study.

7.3.5. Quantitative Data Analysis

All questionnaire data was entered into SPSS for analysis. A multiple regression was performed to test each hypothesis of the study. Predictor variables 'perceived usefulness, perceived ease of use, trust, privacy, attitudes, HCP support and social support' were assessed for how successful they were at predicting behavioural intention to use a concept app designed for motherhood. SPSS was used to conduct the analysis and statistical significance was tested at the $p=<0.5$ level.

7.4. Results

7.4.1. Descriptive statistics

Means and standard deviations were calculated for all variables and displayed in Table 10.

Table 10: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Usefulness	102	3	23	16.58	3.931
Ease of use	102	10	23	19.37	2.305
Intention	101	2	16	11.78	3.389
Privacy	102	3	23	13.55	5.286
Trust	102	2	15	10.86	2.342
Attitude	101	2	16	11.92	2.919
HCP Support	102	8	43	31.42	7.681
Social Support	101	41	78	66.23	8.779
Valid N (listwise)	99				

Table 10 shows the mean of perceived ease of use to be scored quite highly (M=19.37) along with Perceived usefulness (M=16.58) suggesting that participants rated the motherhood app easy to use and perceived it to be useful in their daily lives. The lowest scored mean was 'Trust' (M= 10.86) suggesting that participants rated the least amount of concern relating to the trust of the app.

7.4.2. Correlations

Table 11: Pearson Correlation of variables

Correlations

	Usefulness	Easeofuse	Intention	Privacy	Trust	Attitude	HCPSupport	SocialSupport
Usefulness	1							
Easeofuse	.412**	1						
Intention	.797**	.463**	1	*				
Privacy	-.187	-.206*	-.302**	1				
Trust	.753**	.468**	.703**	-.375**	1			
Attitude	.818**	.478**	.746**	-.278**	.797**	1		
HCPSupport	.103	.023	.016	-.136	.067	.042	1	
SocialSupport	.137	.149	.135	.037	.089	.036	.207*	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Pearson correlations revealed potential issues with multicollinearity between the variables, perceived usefulness appeared to be high correlated with attitudes (r = .818), intention (r=.797) and trust (r=.753), all were significantly correlated as was ease of use, but the correlation was low (r=.412) suggesting no issues of multicollinearity between perceived usefulness and perceived ease of use.

The predictor 'Privacy' displays a significant negative correlation to trust, attitudes and intention suggested that high privacy concerns would result in low trust and negative attitudes and intention to use the app which is compatible with HP2.

7.4.3. Exploratory Factor Analysis

As perceived usefulness correlated highly with intention, attitudes and trust, this highlighted a potential issue with multicollinearity between the predictor variables. An exploratory factor analysis was conducted to examine each component outlined in the proposed extended Technology Acceptance Model. To determine if requirements for factor analysis were initially met, firstly Kaiser-Meyer-Olkin (KMO)measure of sampling adequacy was examined and reached the required cut off >.50 (Gie Yong & Pearce, 2013), (KMO= .79). Next, Bartletts test of sphericity was determined to be significant (p= <0.001) indicating that exploratory factor analysis could continue. (Appendix 14).

The exploratory factor analysis was conducted using Principal Axis Factoring with Varimax rotation. The analysis initially displayed a total of seven factors (see Figure 8, Scree Plot and Appendix 14 for outputs) however due to cross loadings of items, and 'Social support' splitting across 3 factors. the analysis was rerun to only extract a total of five factors. All five factors had Eigenvalues of >1 and explained 68% of the variance in the model (Table 10).

Table 12. Eigenvalue and Percentage of Variance explained for factors

Factor	Eigenvalue	% of variance	Cumulative %
1	10.30	25.76%	25.76%
2	6.50	16.26%	42.02%
3	4.75	11.87%	53.89%
4	3.19	7.97%	61.86%
5	2.55	6.38%	68.25%

Figure 8. ***Scree plot***

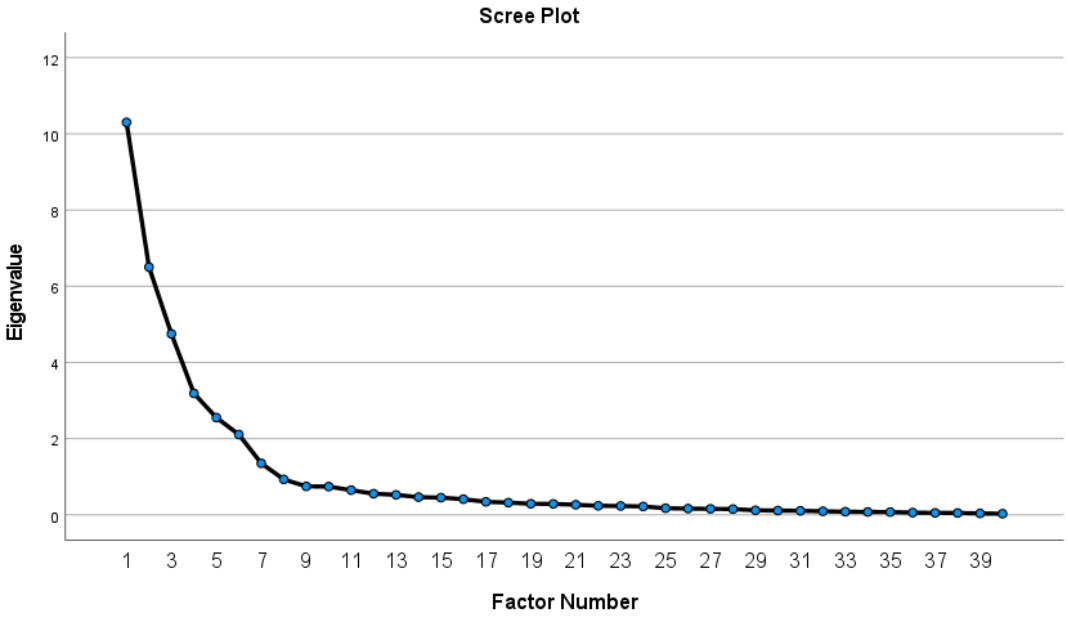


Table 13. Exploratory Factor Analysis

	Factor loadings				
	Factor				
	1. Intention plus	2. Social support	3. HCP support	4. Privacy concern	5. PEOU
Perceived usefulness	.827				
Perceived usefulness	.822				
Perceived usefulness	.820				
Perceived usefulness	.810				
Perceived ease of use1	.587				
Perceived ease of use2					.863
Perceived ease of use3					.820
Perceived ease of use4					.778
Behavioural intentions	.811				
Behavioural intentions	.797				
Behavioural intentions	.852				
Privacy concern				.762	
Privacy concern				.905	
Privacy concern				.918	
Privacy concern				.878	
Trust1	.850				
Trust2	.671			-.344	
Trust3	.521			-.326	

Attitudes	.883		
Attitudes	.781		
Attitudes	.706		
Healthcare professionals			.888
Healthcare professionals			.849
Healthcare professionals			.845
Healthcare professionals			.891
Healthcare professionals			.636
Healthcare professionals			.810
Healthcare professionals			.868
Social support		.633	
Social support		.560	
Social support		.621	
Social support		.734	
Social support		.681	
Social support		.612	
Social support		.582	
Social support		.775	
Social support		.734	
Social support		.669	
Social support		.712	
Social support		.621	

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

As expected from the correlations, the variables perceived usefulness, attitudes, intentions, and trust loaded onto the same factor (Factor 1, Table 13). This suggests that items withing these four predictor variables are potentially measuring the same outcomes. From the results of the factor analysis, the predictor variables will be combined in the subsequent regression analysis into one variable named intention plus. The remaining predictor variables will be examined to determine if privacy, perceived ease of use, social support and HCP support predict 'intention plus'.

Factor 2 (Table 13) contained all items measured on the Social Support scale which assessed Mother's experiences of social support and was named Social Support. Factor 3 contained all items of the HCP support scale which measured Mothers views of receiving healthcare professional support and was named HCP support. Factor 4 included all items on the Privacy Concerns scale which measured privacy concerns

that may arise from using the app and was labelled Privacy Concerns. Factor 5 included the remaining three items from the Perceived ease of use scale and was labelled Perceived ease of use.

Each of the five factors represented the components in the extended TAM model which intended to predict the attitudes and behavioural intentions towards using a concept motherhood app. However, due to four variables loading onto the same factor, this meant model could not be used in its original form, for further analysis therefore this suggests that the model may not be a good fit to assess intention to use a concept mobile app for motherhood. Factors 2 and 3, social support and HCP support, appeared to be useful additions to the model and are both previously validated scales.

7.4.4. Assumptions

All survey scores were entered into SPSS for analysis. Prior to statistical analysis, assumptions were tested. P-P plots were examined for outliers and appeared to be normally distributed with no deviation from the normality line observed (Appendix 14) so assumption of normality was met. To examine multicollinearity within the data, VIF (Variance Inflation Factor) numbers were assessed and ranged from 1.073- 1.089, indicating no significant issues with multicollinearity as all were less than the >5 threshold (Gareth et.al, 2017). To test the independent errors assumption, the Durbin-Watson statistic revealed a score of 1.891, indicating no relationship between model residuals and meeting the assumption of independent errors.

7.4.5. Regression analysis

To determine the significant predictors of intention plus (including perceived usefulness, trust, intention and attitudes) to use the concept motherhood app, a regression analysis was conducted on predictors; *Perceived ease of use, Privacy, HCP support and Social support* and included *'Intention Plus'* as the dependent variable. The results of the regression model revealed that 69% of the variance was explained and the model was significant at predicting intention plus to use the motherhood app ($F(4,98)= 9.630$, $p = <.001$). There were two significant predictors (shown in Table 14) in the model Privacy concerns ($p=0.02$) and Perceived ease of use ($p=<0.001$) the two remaining predictors social support and HCP support were not significant.

Table 14: ***Multiple regression analysis for all predictor variables***

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	12.600	13.279		.949	.345
Privacy	-.531	.224	-.213	-2.372	.020*
Easeofuse	2.455	.505	.438	4.858	.000**
HCPSupport	.035	.154	.021	.228	.820
SocialSupport	.090	.138	.059	.654	.515

** p=<0.001

* p=<0.05

7.4.6. ANOVA analysis

In addition to the regression analysis, variables including 'Mothers age', 'Child number' and 'Child's age' were tested for effect on intention to use the new motherhood app. Based on the results of the factor analysis, ANOVAS were conducted with 'Intention plus' as the dependent variable. Three separates ANOVAS were conducted and produced the following results:

Mothers age- to test if the age category of the mother (participant) effected how likely they were to display intention (plus) to use the motherhood app. The results of the ANOVA revealed no significant difference in mothers age and intention to use the app $F(2,97)= 1.734$, $p=0.182$.

Child number- a second ANOVA was conducted to examine if first time or second time mothers completing the survey were more likely to show intention to use the app. Results of the ANOVA revealed there no significant difference between first and second time mothers and intention (plus) to the use the app; $F(1,97)=2.045$,$p=0.156$.

Child age- a third and final ANOVA was conducted to examine whether the age of the mothers youngest child impacted their intention to use the app. Findings of the ANOVA revealed no significant difference between age of the mothers youngest child at time of survey and intention to use the app; $F(3,97)=0.275$,$p=0.844$.

Full ANOVA outputs with mean plots for all three variables are found in Appendix 14.

7.4.7. Qualitative data analysis

As part of the survey, participants (new mothers) were given the opportunity to respond with any thoughts they had relating to potential use of the motherhood app. Out of 102 mothers who completed the survey, 80 left qualitative responses highlighting the positive aspects the app would bring to new mothers whilst also highlighting any potential concerns or barriers to use of such an app. All responses were fairly detailed in length (ranging from one sentence to a short paragraph), which resulted in a good range of data to analyse from the 80 provided responses. 55 responses appeared 'positive' where mothers stated the benefits of the app and intention to use it. The remaining 25 appeared 'negative' responses and consisted of mothers voicing concerns around the privacy and usefulness of the app. A thematic analysis (Braun & Clarke, 2006) was carried out on this qualitative data and produced 4 themes (presented in Table 15)

Table 15: *Table of themes from qualitative survey analysis*

Theme	Description
'How far I have come as a mother' – encouraging self-reflection	Mothers described how the app could encourage self-reflection on physical recovery and emotions experienced particularly in the early days of motherhood, which could lead to improved postnatal mental health.
'Mother and baby in one place' – a combined app	Many mothers were encouraged by the idea of having a platform to store information about themselves and their baby together. Describing how often mothers would get overlooked with a greater focus on baby in the postnatal stage.
Privacy concerns over sharing personal information	The main 'negative' responses included concerns over the privacy of the app,

	mothers were apprehensive about inputting personal information relating to themselves and baby and which third parties would have access to this data.
'Finding time' and barriers to app use	Lack of time to spend using a motherhood was raised by mothers, along with other barriers including the potential of increased anxiety or stress due to obsessive tracking.

7.4.6.1. 'How far I have come as a mother' – encouraging self-reflection

Many responses from mothers involved how the idea of the motherhood app would benefit their daily lives. Encouraging self-reflection for mothers to look back and see how they have adapted to motherhood was seen as a positive impact the app could have on a mother's wellbeing. Keeping a log of emotions experienced in the early postnatal phase could encourage mothers to look back to see how they felt at times, which could be useful to act as a prompt to sharing with HCPs when seeking support.

> *'It sounds really good, as early motherhood passes by so quickly. It would be really interesting to be able to look back at memories good and bad and see how far I've come.'*
>
> *'I think its a good idea as you can keep a log of everything and then refer back to see how you felt at certain times.'*
>
> *'It was also helpful looking back at these when I went to see the health visitor or for my post natal care, because I could recall information by just looking at the app - not always as easy off of the top of your head when you're exhausted! So I would greatly appreciate an app like this.'*

7.4.6.2. 'Mother and baby in one place' – a combined app

Mothers stated based on previous app use that a combined app of mother and baby personal information storage has been lacking, and many enjoyed the idea of a combined app. Mothers also highlighted feelings of a greater general focus on baby's

wellbeing rather than themselves and the potential of a dedicated section towards mothers having the ability to focus on their personal wellbeing and recovery after giving birth was welcomed. Including distinct sections of the app which solely focused on the mothers also raised positive responses stating how this could lead to improved postnatal mental health for new mothers.

> *'I have been part of numerous apps however most of these once post partum revolve around expectations with baby and not for the mothers recovery and wellbeing (so think its great this is being considered).'*

> *'I think it would be really helpful to have an app that combines tracking information about my baby e.g. feeds, changes etc but also allowed me to reflect on my own mental and physical health.'*

> *'I really am optimistic about this app as it allows mothers to consistently monitor how they feel especially after giving birth, can be genuine and authentic with no judgement passed and would help contribute to a lot of mothers wellbeing and mental health.'*

7.4.6.3. Privacy concerns over sharing personal information

Many mothers who left qualitative feedback on the survey, raised issues regarding privacy of personal information stored on an online platform. Some 'positive' feedback comments stated how mothers found the concept of the app useful, however questioned who would have access to theirs and baby's personal information. Mothers also mentioned a reluctance to share personal photos of their baby on the app unless the app was supported by a reputable source and this information was displayed on the app, to offer reassurance of the safety of personal information stored on the app. Some comments appeared to show a hesitation to using a digital journal, with those having raised privacy concerns also stating how a paper-based journaling method may be preferred.

> *'The idea of inputting such sensitive information into an app (or any digital platform) is not something that I would ever feel confident about. I benefited hugely from having a written paper journal regarding my baby, but would never do that on an app for security and privacy reasons.'*

'The concept of the app is good. However, I am not sure how safe putting the baby's photo is. Also would need some sort of backing from a reputable organisation supporting the app.'

'I think in general this is a good idea, but would much rather keep a journal and write these things down manually, knowing strangers have no access to my information.'

7.4.6.4. 'Finding time' and barriers to app use

The second common appearing 'barrier' to app use was lack of time from a mother's perspective to allocate writing in a journal, particularly in the early postnatal days. Mothers stated that findings the time to engage with the app alongside caring for a newborn baby would be difficult to manage. Some comments also mentioned consistency of app use and its potential longevity, persistent use would likely reduce after the initial months following childbirth and less contact with HCPs, some mothers did not find a use for continued engagement as their baby has developed past the newborn stage.

'The only issue that I would have is finding the time to do this in the day. Mothers are quite tired a lot of the time. The app would be a wonderful way of documenting the time that flies by so fast and of recognizing my own needs and emotions.'

'I know that as a new mother i would not have the time to fill this sort of thing in and if i did it wouldn't be consistent.'

'I think its a really good idea and I would intend to complete it if it was available but I'm not sure I would be able to consistently use this. I imagine this may be used a lot at the beginning but I may fall out the habit or get busy.'

Overall, the qualitative data from the survey reflected the quantitative findings with mothers stating features they would find useful about the app such as the ability to track their mental wellbeing following birth, encouraging self-reflection, and having one place to combine mother and baby information appeared to positively impact their intention to use the app. The issue of privacy was emphasised at the main barrier to app use which was seen in the correlations that privacy concerns negatively affected intention to use the app.

7.5. Discussion

The aim of this study was to test a proposed extended TAM model to assess variables in predicting intention to use a new app tailored towards combining information storing and sharing for mother and baby. Initially, predictor variables included 'perceived ease of use, perceived usefulness, trust, privacy concerns, attitudes, healthcare professional support and social support, however due to findings of the exploratory factor analysis, it was determined that the model could not be analysed further in its original form and with the additional predictors. As intention, perceived usefulness, attitudes, and trust appeared to load onto the same factor suggesting that these constructs are not entirely independent, the four variables were merged to form a new dependent variable named 'Intention plus'. All other predictor variables including perceived ease of use, privacy concerns, social support and HCP support were analysed to examine if they would predict the new dependent variable intention plus. Findings from the analysis showed that 'perceived ease of use' was a significant predictor of intention plus, suggesting that the mothers who viewed the concept design of the app deemed it's features as potentially easy to use and therefore would be more likely to use the app. Relating the findings to Velicia-Martin et.al. (2020) show partial support as it was previously found that perceived ease of use could predict intention, however this model was used in its original form. Velicia-Martin et.al. (2020) also found perceived usefulness to be a significant predictor of intention to use, however in the current TAM perceived usefulness was found to not be an independent construct to intention therefore could not be measured as a predictor variable. Perceived usefulness has previously been found to be a significant predictor of intention to use mobile health apps (Mohammed et al., 2011), suggesting that this variable of the TAM could be most important to users of mobile apps which appears to extend to mothers' intention of use for the new motherhood app.

Privacy concern was also found to be a significant negative predictor of intention plus, suggesting that those who viewed the new motherhood app as potentially unsafe to store personal information in this would lead to less intention to use the app. This finding contrasts with Velicia-Martin et al. (2020) who found that privacy concerns were not a significant predictor of intention to use a Covid-19 app. In line with previous research, 'privacy concerns' have shown to be a strong predictor of intention to use pregnancy and motherhood apps. Lupton & Pederson (2016) highlighted that

users of pregnancy apps often do not raise privacy concerns around the sharing of personal information and how often the benefits and enjoyment of self-tracking personal data outweighs the privacy and security risks. However, participants in the current study appeared to show concern over inputting personal information particularly relating to baby, with some referring to a paper-based journal and information storing source being safer to use, and this being unknowingly shared with third parties. Scott et al., (2015) found that mobile health app users are at risk of their information being shared with third parties due to low uptake in apps informing users of how their personal information is used. Some apps include privacy policies, as shown in study 4 app review, which inform users of how their data stored on the app will be used and shared with third parties to reduce privacy and security risks (Barassi, 2017), which would be a consideration if the current new motherhood app were to partake in future development.

As the exploratory factor analysis revealed Trust to load together in the 'Intention plus' variable, the trust scale could not be examined as a predictor of intention to use a new motherhood app. Velicia-Martin et al., (2020) found trust to be a significant predictor of use of a new Covid-19 app. This could have been due to participants having a clearer idea of who the app owner was or who would have access to personal data, for example health care professionals which was not identifiable from the mock app displayed in the current study. Previous literature has indicated trust to be an issue when related to information provision amongst online resources (Hughson et al., 2018), this could explain the non-significant findings from the current study as the concept app for motherhood was presented a tool for personal data inputting and tracking rather than a source to extract information. Therefore, participants may have been less concerned about trust issues when viewing the images of the concept app design. Sharing of personal generated data online has previously shown to raise trust concerns (Brown et al., 2022) for example a reluctance to share personal data via social media, however there was a stronger willingness to share personal information with HCPs.

Extending the TAM further from Velicia-Martin et al., (2020) to include healthcare professional support and social support allowed investigation of using the new motherhood app to fill gaps in postnatal care identified through previous literature (Peyton et al., 2014). Both healthcare professional support and social support were not

significant in predicting intention (plus) to use the new motherhood app however, this could be an area to warrant further investigation due to finding from previous literature highlighting both the importance of social support and the lack of HCP support and information provision in the early postnatal period (Peyton et.al., 2014; Grimes et al., 2014; Henshaw et.al., 2016).

The findings of the ANOVAs displayed no significant findings suggesting that age of child, mother or whether the mother is first or second time does not appear to impact the intention they have to use the app. This is an area that could warrant further investigation as during pregnancy first-time mothers have regular contact with antenatal HCPs which is greatly reduced in the postnatal phase, therefore a tool to fill these 'gaps in care' or act as a source to reflect on new experiences of motherhood could be most beneficial to first time mothers.

This would also link to study 2 as the first-time mothers who were given the new mum journal discussed self-reflection as a first-time mother an important and useful feature of the journal which could be reflected in the intention to use a digitised app version of the journal combined with elements of the 'red book'. Often women who lack HCP support in the postnatal phase will implement technology use to fill gaps in care due to reduced postnatal contact with HCPs (Kraschnewski et al., 2014), therefore it could be with further investigation that new mothers could also use the new motherhood app if it were to offer dual use as an information extraction tool as well as a digital personal information storing tool.

7.5.1. Strengths and Limitations

The strength of this study was to develop theory using further extended technology acceptance model (TAM) and applying this to examine new mothers' attitudes and intentions to use a concept app design to combine storing of mother and baby information on one platform which is novel to the literature. This study highlighted flaws with the original TAM as further investigation of constructs revealed issues with multicollinearity between variables, therefore the model was transformed to include a new predictor variable 'intention plus' (perceived usefulness, trust and attitudes) and examined to see if predictors privacy, perceived ease of use, social support and HCP support could predict intention plus. The significant predictors of perceived ease of use and privacy concerns of the app showed how new mothers viewing the design of the app found the features to be easy to use in aiding the inputting and tracking of both

mother and baby's wellbeing, and if participants had high privacy concerns related to the app and how personal data would be managed this would result in low intention (plus) to use the app.

Previous studies throughout this thesis have focused mainly on recruitment of perinatal women living in Northeast England. However, to gain a wider consensus of how a concept motherhood app could appeal to new mothers, the sample of new mothers from this study were recruited UK wide. Findings from this study have also extended the findings from previous studies throughout this thesis as themes such as self-reflection, combined mother and baby tools to improve support and communication and privacy concerns around technology based support tools have occurred throughout.

Limitations of the current study include sample size; due to the exclusion of incomplete surveys the sample size was reduced which could have impacted the success of the full model being investigated. Larger sample sizes could lead to more robust testing of the extended model such as structural equation modelling as seen in previous research (Velicia-martin et al., 2020). However, this does pose an opportunity for further examination of the TAM in relation to prediction of intention to use a new motherhood app as this is a novel concept to the literature therefore these preliminary findings are the first step to developing this further. Although the concept app design enabled mothers to view its design and potential features, as participants were only able to view this as an image this may have reduced ability to fully interpret intention to use it as a fully working app. Ease of use of the app could have been more accurately examined if participants were given a working prototype of an app to test the features of the app. Further research could make use of proposing a more interactive design of the concept all design to allow potential users to test features to determine their ease of use which may alter attitudes and intentions towards regular use of the app.

7.6. Conclusion

This study extended the findings and theory of an extended Technology Acceptance Model to predict intention (plus) to use a new motherhood app based on storing and tracking personal mother and baby in a combined platform (combining the 'new mum journal' (Study 2) with elements of the eRedbook). The findings from this study have built on studies throughout this thesis which have alluded to the need for a motherhood

focused technology-based tool for new motherhood for mothers to track their own wellbeing and physical recovery following giving birth. Study 2 explored, using case study methodology, the idea of a personal information storing tool for new mothers to encourage focus on their own physical and mental wellbeing. Findings from study 2 and study 4 emphasised how a digital based tool or app for motherhood which encompasses mood tracking, general wellbeing and combining mother with baby was needed. This concept app design of a new motherhood combined app is the first step to providing new mothers with a tool to track physical recovery from birth and postnatal mental health and be able to share this information more readily with health professionals, which could result in improved communication between women and HCPs and better access to postnatal care and support.

Chapter 8: General Discussion

This discussion chapter provides an overview of findings from chapters 3-7 (study 1-5) of this thesis in relation to the research aims and objectives outlines in the introduction chapter (Chapter 1) and the literature presented in chapter 2. This chapter is comprised of four sections. The first section provides an overview of the findings from each study in this thesis and will discuss the context of the research aims and objectives. The second section will centre on three overarching findings from across all five studies (Privacy implications, Personal generated data (PGD) vs information, and Self-reflection as a mediator of communication) and will reflect on the original contributions to knowledge. The third section will discuss the practice implications and NHS context applying the findings to UK maternity services. The fourth section will discuss strengths and limitations of the thesis and provide ideas for future work to extend the findings presented in this thesis.

8.1. Research aims

The main aim of this thesis was to examine how both pregnant and postnatal women (referred to as perinatal women) seek health information and support, how they work with this information to both store it and share it in online and offline channels (for example via social media or with friends, family, and healthcare professionals). In support of this aim, the role of health care professionals (HCPs) was examined to gather perspectives of how maternity care is currently provided to UK mothers and how information is both given and received by HCPs. Finally, the role of technology was examined specifically by i) undertaking a review of current available apps for pregnancy and motherhood and ii) the design of a mobile app-based tool concept to provide support to new mothers. A mixed-methods approach was taken in this thesis to explore three identified research questions:

1. How do perinatal women engage in health information work?
2. What is the role of health professionals in providing support and information to new mothers?
3. How can technology be used as a supportive tool for new mothers?

8.1.1. Research objectives

As outlined in the introduction chapter (Chapter 1), to answer the three research questions, five research objectives for this thesis were identified and examine across five studies presented in this thesis. Research objectives were met with the recruitment

of perinatal women to explore their information needs and gain a sense of what resources new mothers are using or being provided with to meet information needs. To gain a perspective of maternity healthcare professionals in the provision of information and support to perinatal women, midwives and health visitors were recruited to the study. The research objectives were:

1. To identify current information needs of perinatal women and explore the changing needs across the timespan of early pregnancy to early motherhood (Study 1)
2. To discover how perinatal women are using information once sought, how this information is stored and shared in online and offline channels. (Study 1 and 2)
3. Explore how a technology based (and paper based) motherhood specific information PGD (Personal Generated Data) tool could encourage new mothers to store PGD and share this with HCPs (Study 2 and 5)
4. Gain a health professional perspective of how UK maternity services are currently providing information and support to perinatal women. (Study 3)
5. Review the currently available mobile health apps for pregnancy and motherhood to identify useful features, user perspectives of information provision, and functionality. (Study 4)

8.2. Summary of main thesis findings

A mixed methods approach was taken to meet the research objectives throughout this thesis. The samples throughout this thesis have mostly been representative of Northeast England including both perinatal women and healthcare professionals. Participants in studies 1 and 2 comprised of White British perinatal women primarily based in Northeast England. HCPs from study 3 were all White British mostly based in Northeast England. Study 5 included a more varied sample with perinatal women based in the UK. All mothers interviewed in the qualitative studies (1 and 2) were either married or living with partners (fathers of children). Studies 1-4 used qualitative methodology and study 5 was primarily quantitative with qualitative data collection from the survey. Findings from Chapter 3 (study 1) revealed that there is a changing pattern of information needs across the timeline span from pre-pregnancy to the postnatal period, however the postnatal period appeared to be the time point where mothers have the most unmet needs and lack of support from HCPs compared to

pregnancy and birth. Findings from this study led to a greater focus on postnatal mothers and Chapter 4 (study 2) took a case study approach to understand the information needs and levels of support received by new mothers across the initial six months post birth. The design of an information support tool (new mum journal) was implemented to examine if this could assist new mothers to have a personal resource to input personal information relating to experiences of physical recovery from birth and mental wellbeing. As findings from Chapter 4 (study 2) highlighted the importance of relationships with HCPs to encourage information sharing and the possibility of the information tool encouraging information exchange between new mothers and HCPs, Chapter 5 (study 3) aimed to gain a perspective from maternity HCPs (midwives and health visitors) to understand current provision of information, how postnatal visits are structured and what access to support is available to new mothers.

The use of technology based information resources was commonly discussed amongst new mothers including the use of mobile health apps to both store personal generated data (PGD) and extract information, therefore Chapter 6 (study 4) aimed to review current available mobile health apps for both pregnancy and motherhood to explore the features and information that is provided on apps, whilst also gaining a sense of current users (new mothers) barriers and facilitators to using the apps. The final study (Chapter 7, study 5) used quantitative methods to examine predictors of a concept mobile app designed to support new mothers in recording personal experiences of motherhood combined with baby related information. Findings from Chapter 7 (study 5) found that the original format of the TAM model was not suitable for testing therefore a new version of the model was analysed to include a combined variable 'intention plus' (perceived usefulness, attitudes and trust). Perceived ease of use and privacy concerns were both significant predictors of 'intention plus' .Barriers centred on privacy concerns around storing personal data in the app and facilitators towards use of the app included encouraging self-reflection to improve maternal wellbeing. Findings from each study met each of the main research questions outlined in Chapter 1 (Introduction) and led to the development of study specific research questions throughout the thesis to examine the information needs of perinatal women and the role of technology support tools to assist in meeting such needs and improving maternal wellbeing and communication with HCPs.

8.2.1. Study 1

To investigate the first research question; *'How do perinatal women engage in health information work?*', a qualitative study involving interviewing 10 perinatal women mostly from Northeast England was designed. Semi structured interviews were conducted to identify information seeking behaviours of perinatal women. Findings were reflective of the timeline spanning pre/early pregnancy, mid pregnancy, late pregnancy/labour and birth, and postnatal. These time points acted as the four main themes from the analysis, however sub themes described specific information seeking behaviours during these time points such as 'Continuity of health professionals leads to information exchange', 'Technology used to facilitate midwife appointments' and 'Lack of HCP support increases use of on/offline sources'. This study contributed to existing literature which previously highlighted a 'gap in care' present in the early pregnancy stage due to limited contact with HCPs in the first trimester (Peyton et.al., 2014) and information needs being largely unmet by HCPs in the postnatal phase (Sink ,2009, Henshaw et.al. 2018)., Adopting a timeline approach to the findings of this study allowed examination of the information needs of perinatal women across both pregnancy and postnatal, to which previous literature had focused on specific time points throughout this journey.

The findings of Chapter 3 (study 1) also provided a deeper focus on the use of technology to support the information needs of perinatal women and extended the findings of Lupton & Pederson (2016). Although previous literature has showed the process of using technology to meet information needs (Lupton & Pederson, 2016), this study has revealed how use of technology related information seeking can be useful to facilitate discussion with HCPs. During pregnancy and postnatal these discussions can lead to process of sharing information and information exchange. Information exchange encompasses the process whereby women are encouraged to share personal information with HCPs which leads to greater access and tailored support and information. This information exchange process is likely to be successful if relationships have built between women and HCPs over the course of pregnancy to postnatal, however as women are often introduced to new HCPs after giving birth this has potential to reduce the information exchange process resulting in less access to information and support in the postnatal stage. These findings led to the design of study 2, where a longitudinal case study approach was taken with two of the mothers

interviewed from study 1 to gain a further sense of how information and support was provided by HCPs to new mothers in the early postnatal phase.

8.2.2. Study 2

To further answer the first research question, *'How do perinatal women engage in health information work?*' Chapter 4 (study 2) continued the findings of study 1 by taking a longitudinal case study approach with two new mothers interviewed in study 1. New mothers were interviewed monthly for the initial six months (minus month five) giving a total of ten interviews. Chapter 4 (study 2) took an in-depth approach to examining how new mothers navigate information needs after giving birth and what support and information is provided to new mothers by HCPs during the initial six month postnatal. The findings in Chapter 4 (study) highlighted three main themes; 'Postnatal information seeking', 'Curating and sharing personal generated data (PGD)', and 'Digital platforms to record and share PGD'. These findings contributed to previous literature which identified that new mothers experience reduced contact with HCPs in the postnatal phase (Slomian et.al., 2017) and display the need for further support and information during the postnatal stage (Ollander et.al., 2019; McCleish et.al., 2020). This study made two novel contributions to the literature, firstly taking a longitudinal case study approach to understanding the information needs and support of postnatal mothers and secondly the design and implementation of a paper-based journaling tool for new mothers to store personal information and experiences of motherhood. The journal covered weeks one to twelve postnatal and mothers were asked to write weekly entries. Mothers felt that the process of storing information encouraged self-reflection which made positive impacts on maternal mental wellbeing. A digitised version of the journal was considered by new mothers to be a more time-efficient way to store personal information and would enable further features such as mood tracking. However, digital resources also highlighted some privacy concerns which are addressed further in this chapter.

8.2.3. Study 3

To answer research question two; '*What is the role of health professionals in providing support and information to new mothers?*', an additional qualitative study was designed and recruited five health professionals (three midwives, two health visitors) to gain a perspective of how maternity services are currently offering information and support to postnatal mothers. Four main themes were found; 'The routine nature of

appointments', 'A two-way exchange: Information sharing, new mother's and HCPs', 'A focus on mum's mental health' and 'Digital record keeping for mother and baby'. Previous literature had shown that factors such as high workload and communication difficulties could affect how continuity of postnatal care is offered from an HCP perspective (van Stenus et.al., 2020). The findings presented in Chapter 5 (study 3) supported study 2 as HCPs also stated that relationship building between themselves, and new mothers can help to encourage an information exchange process and women are more likely to share personal information with HCPs if a relationship is built prior. Chapter 5 (study 3) also contributed to the literature by providing further HCPs perspective on how mental health support is currently offered to new mothers and highlighted a need for a more streamlined approach to referrals to mental health services for new mothers. HCPs interviewed in study 3 also revealed that digital sources of information could be a positive addition to health practice and have the potential to improve communication with perinatal women. The findings from chapters 3,4, and 5 led to the need for a deeper investigation of the current technology available to perinatal women and how this is viewed from a user perspective, which was outlined in the subsequent chapter 6 (study 4).

8.2.4. Study 4

To answer the third research question; 'How can technology be used as a supportive tool for new mothers?', Chapter 6 (study 4) presented findings from a mobile app review of apps designed for pregnant and postnatal mothers. This compromised of an autoethnographic observation of apps, functionality review and user review analysis of twenty currently available apps for pregnancy and motherhood. Findings from the analyses showed most apps to be information centred and provision of information amongst apps was the most identified feature. Alongside provision of information on the apps such as articles, the ability to store information in the form of PGD also frequently appeared on the reviewed apps. Tracking features were common on pregnancy apps for example tracking baby's sleep, feeding and developmental milestones however, fewer features were included which allowed mothers to track their own personal data, particularly for postnatal mothers such as tracking mood or physical recovery from birth. The findings presented in Chapter 6 (study 4) contributed to the literature by addressing findings focusing on specific apps for motherhood as well pregnancy, extending the findings of previous pregnancy app reviews (Lupton,

2016; Brown & Bucher, 2019). User reviews allowed an inspection of how new mothers were using the mobile apps to meet information needs and access support, for example the use of community features as shown in previous literature (Sakamoto et.al., 2022). User reviews also demonstrated that apps and features designed specifically for new mothers were lacking and current features appeared to have greater focus on foetal and infant development and less towards the mother. Having a tailored motherhood app which allows new mothers to store PGD could be beneficial in encouraging self-reflection and improving maternal wellbeing, therefore these findings lead to the design of the final study (study 5) present in chapter 7.

8.2.5. Study 5

To further investigate research question three, chapter 7 (study 5) presented the final study of this thesis. A mixed methods approach was taken in this study to examine one hundred and two new mothers' attitudes and intentions to use a mobile app designed specifically with the aim of storing PGD for mother combined with baby. Building on the findings from previous chapters which indicated the need for a supportive tool to be designed for new mothers to store personal information the final study included the design of a mock mobile app (presented in image format to participants) to gain an sense of predictive factors to intention to use the app. Chapter 7 (study 5) built upon the theoretical construct, the Technology Acceptance Model (TAM) (Davis, 1989) by presenting a novel extended version of the model to apply to new mothers as users of the technology. However early exploratory analysis of the model revealed flaws in the model which led to an alternative version being implemented for analysis included a combined variable of 'intention plus' (including perceived usefulness, attitudes, intention and trust). .As well as original predictors 'perceived ease of use', the model presented in chapter 7 (study 5) was based on a previously extended TAM model (Velicia-Martin et al., 2021) which added the predictors 'privacy' however due to the importance of social support and apparent lack of HCP support in early motherhood (Peyton et.al., 2014; Grimes et al., 2014; Henshaw et.al., 2016), the extended TAM presented in chapter 7 (study 5) included 'HCP support and Social support' as predictors of intention to use the motherhood app. Although statistical analysis found only perceived ease of use and privacy as significant predictors of intention plus, this study's findings contributed to the literature by firstly presenting a potential alternative version of the model to its original form and extended TAM to apply to new mothers

which encourages further research into examining the factors which may influence mothers to use technology-based tools. Secondly, designing a technology-based tool that could be used to support mothers to store PGD in the postnatal phase and make information sharing easier. Qualitative findings presented in chapter 7 (study 5) addressed the potential barriers to the motherhood app which were centred around privacy of data, which will be discussed further in the next section of this chapter.

8.3. Overarching findings from the thesis

As well as the main findings presented from each study in this thesis, there were three overarching themes that were identified across chapters i) personal generated data versus information extraction, (ii) self-reflection as a mediator of communication and (iii) privacy concerns.

Taken together, the key themes of this thesis have implications for health practice and prompt discussion into the implementation of technology-based support tools in UK maternity services.

8.3.1. Personal Generated Data (PGD) vs Information Extraction

The first key theme reflecting the findings across chapters in this thesis was defining a clearer representation of information needs of perinatal women which has contributed to the understanding of how perinatal women engage with 'information work' throughout pregnancy and postnatally. There are two types of process which have been explored through this thesis to show how perinatal women meet their information needs during pregnancy and motherhood. These processes termed 'Storing PGD' and 'Information extraction' both contribute to information sharing which can assist perinatal women to meet their information needs throughout pregnancy and motherhood.

The first process is the storing of personal generated data (PGD), this occurs when perinatal women store personal health information on platforms such as mobile apps, paper-based journaling, and social media. Previous literature has shown that during pregnancy and early motherhood, women use mobile apps to track their own and their baby's personal information (Lupton, 2017) and this can be a useful way for pregnant women to bond with their unborn baby (Hamper & Nash, 2021). However as seen throughout this thesis, the opportunity to store PGD related to themselves during pregnancy and postnatal is less available on mobile apps designed for pregnancy and

motherhood and the findings presented in chapter 6 (study 4) alluded to the need for a motherhood focused mobile app to allow new mothers to store their own PGD to track emotional and physical changes during early motherhood. Across study 2 (chapter 4) and study 5(chapter 7) the design of a technology-based tool for motherhood added to the literature and proposed the design of a mobile app for new mothers to input their personal data into for example experiences of physical recovery and emotional wellbeing following birth. The design of the mobile app examined in chapter 7 (study 5) aimed to combine aspects of mobile apps women have been shown to enjoy using such as tracking of their baby's development and milestones along with a journaling feature specific for new mothers to input PGD and track this information.

The second process is information extraction, which occurs when perinatal women use technology-based resources such as mobile apps, the internet, and social media to extract and gather information. Previous research has shown how perinatal women seek information and has also demonstrated the types of information important to women during pregnancy such as foetal health and infant development, pregnancy symptoms and complications (Kamali, et.al,2018). Postnatal mothers describe a need for information and support relating to child rearing such as breastfeeding difficulties and infant health (Guerra-Reyes et.al, 2016. Obtaining this information can lead to feelings of empowerment amongst new mothers as they experience increased knowledge of pregnancy development and child rearing (Lagan et.al, 2011). To gather this information, perinatal women have been shown to choose the internet as a popular information source (Lupton, 2016), however many women describe discussions with HCPs and particularly midwives to be the most common and trusted source of information (Grimes et.al., 2014).

However as discussed throughout this thesis, mothers' experiences gaps in care which leads to less access to information from HCPs during this time points which have been identified as early pregnancy and postnatal. As discovered in chapter 3 (study 1) perinatal women journey through a timeline of information needs across pregnancy and postnatally and this thesis has addressed further gaps in care present in the postnatal phase which has previously been understudied in the literature. To address the information gap and lack of support experienced during the postnatal phase, the design of the mobile app presented in chapter 7(study 5) developed from the paper-based journal in chapter 4 (study 2) offers a conceptual resource for new mothers to

store PGD and informs future research into the development of a technology-based support tool for new mothers to track their personal information during the gaps in care experienced in the postnatal phase.

Taken together, monitoring, tracking, and storing PGD and information extraction can both lead to improved information sharing. Storing personal data on digital platforms such as mobile apps and social media can lead to information needs being met. Perinatal women have expressed sharing their personal information on social media platforms such as internet forums (Wexler et.al., 2020) to share lived experience of pregnancy and motherhood related issues. As discussed in chapter 1, gaining information from discussions on internet forums can improve shared decision-making amongst new mothers, who may feel empowered to partake in their own healthcare decisions and make informed choices (Lagan, et.al, 2011) and has also shown to lead to feelings of empowerment over what to expect during pregnancy, birth and postnatal (Johnson, 2014). Although perinatal women can feel empowered to share PGD with HCPs for example to encourage shared decision-making, sharing information found online with HCPs is less observed (Sayakhot, 2016).

Understanding the processes perinatal women engage with to meet information needs throughout this thesis has led to an increased awareness of how personal information is stored and shared and how technology-support tools can promote easier storing and sharing of information. The design of the new motherhood app acts a prompt to encourage information sharing amongst perinatal women and new mothers and gives scope for further research to address how this tool could be implemented to improve communication with HCPs and perinatal women, as discussed in the next section of this chapter.

8.3.2. Self-reflection as a mediator of communication

The second key theme presents a novel finding to the literature and discusses how new mothers use self-reflection as a mediator of communication. The design of the ‘new mum journal’ in chapter 4 (study 2) allowed the new mothers who participated in the case study to record their personal experiences of early experiences of motherhood, physical recovery from birth and emotional wellbeing which results in a process of self-reflection for the new mothers. Looking back on the previous week allowed mothers to gain perspective on how far they had come as a new mother or reflect on their mood changes to allow clarity when dealing with postnatal mental health

struggles (chapter 4). This kind of self-reflection is an important element of self-care and wellbeing (Claisse et.al., 2022) and may prove valuable in and of itself. However, a key finding presented in chapter 4 (study 2) was that the new mum journal allowed both reflection and encouraged communication. New mothers spoke of using the journal to prompt support and information seeking directly from HCPs which has potential to improve information exchange.

The new mum journal acted as an unseen mediator of communication. Mums did not necessarily use the journal as a visible mediator of communication with HCPs, (as they wanted to keep aspects of the journal private) but would rather view information stored in the journal prior to appointments with HCPs and use it to prompt questions and to perform a sense check around their experiences before engaging with HCPs. This can also act as a prompt to encourage new mothers to seek support direct from HCPs, which previous literature has shown to be an area new mothers struggle with (Ghiasi, 2021). This finding makes an original contribution to the literature as findings relating to new mother's use of journaling have been underexplored and offers a useful solution to the barriers to accessing support directly from HCPs as new mothers often believe postnatal appointments to be largely baby focused and less mother focused as shown in chapters 4(study 2) and 7 (study 5) and termed the 'invisible mother' in past literature (Devries, 2017).

Developing the new mum journal into an app-based support tool for new mothers also has shown to encourage self-reflection. Chapter 7 (study 5) reported on findings highlighting how inputting PGD into a motherhood focused app could help new mothers to reflect on how they have adapted to motherhood, look back at memories and use the information on the app to recall during appointments with their health visitor. The new motherhood app could be a beneficial way to improve communication between perinatal women and HCPs using self-reflection as the mediator. This extends findings previous literature which has shown communication between perinatal women and HCPs to be easier when a good relationship has previously been built (Doherty et.al., 2020), however during the postnatal phase when mothers are often introduced to new health professionals and mothers are more reluctant to share personal information (Meyer et.al., 2016), the design of a mobile app to record PGD could act as a useful tool to encourage new mothers to share their personal information with HCPs and provides a basis for future research to examine further how technology

based support tools can be used by new mothers to encourage them to partake in information exchange and potentially gain access to further information and support from HCPs.

8.3.3. Privacy concerns and implications of technology-based support tools

The final key theme that appeared across chapters 4 (study 2), 5 (study 3), and 7(study 5) was that of privacy concerns. This was seen during the proposed digitisation of a paper-based 'new mum journal' (study 2) to a digital platform, as well as through the perspectives of HCPs in the development and implementation of technology-based tools in maternity services (study 3) and by examining the predictive factors of intention to use a future app specific to motherhood and maternal wellbeing (study 5). Privacy concerns that were most often highlighted in these chapters related to the storing of personal generated data (PGD) on digital platforms in particular concerns relating to third party access. In relation to media and mobile app use, privacy concerns focused on reluctance by mothers to share personal information related to their baby on digital platforms. Concerns did not appear to relate to the sharing of their own PGD. This extends the findings of previous literature for example Orton- Johnson, 2017, who found that mothers can gained a sense of empowerment by sharing their experiences of motherhood in online platforms but were unwilling to share personal information relating to their child because of information ownership issues.

Interestingly, the user reviews in chapter 6 (study 4) did not highlight privacy concerns as a barrier to use in relation to mobile apps for pregnancy and motherhood. However, user reviews often centred on information extraction from mobile apps and were less focused on the storing of PGD on the app. Less than half of the apps reviewed were explicitly monitored by HCPs however users did not appear to be concerned over the accuracy of information provided on the apps. This is reflective of findings from Lupton & Pederson (2016) who found that users of pregnancy apps often fail to examine the accuracy of information or raise privacy issues and appear to trust the information provided on apps and Bussone et.al, (2020) demonstrated how users of digital platforms often assess trust based on credibility and reputation. 'Reputation Indicators' are also used to assess the credibility of digital platforms (Bussone et.al., 2020) and will often value the aesthetics and usability to determine if it is trustworthy. It remains unclear however, whether users are more likely to trust app or at least raise

fewer concerns on the apps which appear to be monitored by health professionals or contain information from reputable sources. This warrants a suggestion for future research to determine what the specific trust factors are amongst mobile apps for pregnancy and motherhood.

Most apps reviewed in chapter 6 (study 4) included privacy policies outlining how data would be stored and if the apps would share personal data with third parties, this information also appeared in the app store prior to download. This could offer an explanation as to why users of mobile apps display less privacy concerns as they are given information as to how their data will be used, this offers a potential area for future research to examine the relationship between privacy policy and privacy concerns of pregnancy and motherhood app users. General mobile health apps rarely contain privacy policies (Sunyaev et.al., 2015), however clear privacy policies to identify how user data would be managed in a mobile health app can encourage app use (Zhou et.al., 2019). Therefore, as pregnancy and motherhood apps appear to contain privacy policies (in comparison to general health apps at least) this may influence app and help users to display fewer privacy concerns. Bussone et.al, (2020) found that those who use digital platform for health issues, privacy policies and clear privacy controls are valued features in determining if the platform is trustworthy. Findings from chapter 7 (study 5) found privacy concerns around the newly designed app for motherhood, to be a significant negative predictor of intention plus, suggesting those who were concerned about privacy of placing personal data on the app were less likely to intend to use it. However, the inclusion of a privacy policy was not stated in the design of the new mobile app for motherhood, nor was the monitoring or affiliation to health professionals, which may have caused participants to raise concerns regarding privacy concerns and the safety of data if using a complete version of the app. This presents an area for further investigation to examine intention to use the new app for motherhood app based on the inclusion of a privacy policy stating how storing PGD relating to both mother and baby would be managed.

Healthcare professionals interviewed in study 3 (chapter 5) discussed privacy concerns in relation to digital technology tools being implemented for new mothers and maternity services and questioned how safe personal data would be stored on mobile apps.

They also stated barriers to technology use relating to digital inclusion for mothers and particularly low SES (socioeconomic status) mothers. The issue of accessibility was raised by HCPs and has also been echoed in previous literature the 'digital divide' (Zimmerman, 2017) occurring when low SES mothers have less access to technology resources compared to those who have increased access. Although accessibility has shown to be improved for new mothers and mobile apps are being increasingly designed to be inclusive to low-income mothers (Peyton et.al., 2014, Chan & Chen, 2019). Low SES mothers can still be excluded from mobile health app use when fees are associated with app use (Guerra-Reyes et.al., 2015). Findings presented in chapter 6 (study 4) discussed the commonly occurring negative reviews from pregnancy and motherhood app users related to the fees associated with registering to use the app or to access the apps functionality in full. This can be problematic for low SES mothers, therefore, to ensure digital inclusion the new motherhood app presented in chapter 7 (study 5) would need to be designed as accessible to all mothers to ensure digital inclusion.

8.4. Implications for health practice and NHS context

As well as implications for perinatal women, the findings of this thesis have implications for health practice as well. As outlined in chapter 2 (literature review) in the UK maternity services have implemented a digitised version of the paper-based personal child health record book named the eRedbook and as part of the 'Better Births' NHS five-year plan to improve maternity services in England (Cumberland, 2016). The 'Better Births' plan indicated that introducing digital services to maternity care is expected to improve communication and sharing of information between HCPs and enhance women's experiences of maternity care. However, research examining use or benefits of the eRedbook has been largely overlooked in the literature, with few studies producing findings into user perspectives of the eRedbook examining barriers to use such as privacy of information stored digitally, accessibility for low SES mothers and digital literacy skills among women and HCPs using the digital tool (O'Connor et.al., 2016). These findings were reported early on in the implementation of the eRedbook and follow up studies have been underexamined in the literature. To address the gap in literature and examine further views of new mothers and HCPs potential use of the eRedbook, this topic was explored with new mothers and HCPs interviewed through chapter 4 (study 2) and chapter 5 (study 3).

At the time of conducting study 2 (Chapter 4), the eRedbook was an early concept and in the Northeast of England, where most participants resided, had not been implemented into maternity services. Therefore, new mothers who participated in the case study discussed their perspective on the potential of an eRedbook rather than their actual use of the digital tool. Findings reported in chapter 4 (study 2) showed new mothers believed the eRedbook would be a useful tool to store information about their baby and would provide quick and easy access to this information, this was also perceived to be beneficial for sharing the information with HCPs and gaining quicker access to support. This supports previous literature which found that new mothers stated ease of use and access to information would be the most important feature of a digital information tool (Lupton, 2016). From participating in the 'new mum journal' designed for study 2, the new mothers mentioned having a combined tool to store both PGD related to the mother and baby information would be desired as currently they recognised the eRedbook to be solely baby focused. Developing the new mum journal into a digital mobile app format has the potential to have beneficial use to both new mothers and HCPs as it may encourage communication which could lead to an information exchange process whereby mothers share more personal information related to themselves which could result in quicker access to health care during the postnatal stage. During interviews with HCPs reported in chapter 5 (study 3), use of a digital tool for mother and baby information was discussed. Concerns such as maintaining the personal element of face-to-face contact with new mothers, privacy in information stored in a digital eRedbook, and ensuring digital inclusivity for all mothers were raised, however HCPs did also note that digital platforms could be a more efficient way to store information.

NHS digital maternity services (digital.nhs.uk) have also implemented a technological approach to the storing of medical maternity information, with the digitalisation of the paper-based antenatal maternity notes onto a mobile app named Badgernet. As outlined in Chapter 2, few studies have examined the efficacy of the Badgernet mobile app however previous literature has shown that issues such as access and functionality of the app had resulted in a reluctance to use the app (Sarre et.al., 2021). While conducting study 1 (chapter 3) and study 2 (chapter 4), Badgernet maternity notes mobile app had not been introduced into Northeast England maternity services, therefore women did not have experience of using the app. However, women

interviewed in study 1 were asked about their paper based maternity notes and findings showed mothers did not realise they would no longer have this information after giving birth and reported a sense of ownership of this information. Storing this information on a mobile app could be beneficial to new mothers as they would have unrestricted access to their personal medical information. Expanding on this, the concept app designed in chapter 7 (study 5) could be an improvement to digital maternity services, allowing new mothers to store their own information in a mobile app which could then be shared with HCPs, which could be particularly useful during the transition to postnatal care and provides a basis for future research to assess the efficacy of the motherhood app as a method to improve maternity care and communication between new mothers and HCPs.

The 'Maternity Transformation Programme' (NHS England) was designed to achieve the outcomes of the 'Better births' plan for digital maternity service by addressing key areas such as 'improving access to perinatal mental health services', 'sharing data and information', and 'harnessing digital technology' (NHS England). A four-year review of 'Better births' (NHS England, 2020) highlighted that 'all women will have access to their maternity digital care record by 2024' and that no improvement to postnatal care had been shown and highlighted the challenges faced to postnatal care such as tailoring to individual needs. The focus of this thesis has largely centred on postnatal care and findings have addressed what the main issues are for postnatal mothers accessing postnatal maternity services: lack of continuity of care, less access and focus on the mother compared to the baby during this stage and a reluctance to share information due to HCP transitions. Highlighting the key barriers to postnatal maternity care has led to the design of a technology-based support tool that aims to offer mothers a platform to focus on themselves as well as baby and provides a basis for easier sharing of personal information from new mothers to HCPS which could improve access to postnatal information and support.

Involving key stakeholders (perinatal women, midwives and health visitors) in interviews throughout this thesis helped to gain perspectives on the introduction of technology-based support and information tools that could be used in digital maternity services. Generally, outcomes from the studies examined in this thesis show a positive view on adapting maternity services to digital platforms and has potential to draw many benefits such as improving maternal wellbeing and increasing communication

and information exchange between women and HCPs. Findings from this thesis have addressed a gap in the literature to assess how new mothers could use technology-based support tools to address the gaps in care identified specifically to the postnatal period and have displayed real world applications showing which factors could predict the use of a mobile app specifically designed for motherhood and sets a basis for developing this tool with the input of key stakeholders including new mothers to potentially improve access and development of digital maternity services.

8.5. Strengths and Limitations

Findings in this thesis have shown a greater understanding of the information seeking behaviours of perinatal women and acknowledged the role of technology both in current UK maternity services and through the conceptual design of a technology-based support tool for new mothers, which has the potential to impact maternity practice. The strengths of this thesis were the original contributions made to literature, taking a longitudinal approach to examining the information needs of perinatal women across the timeline of pregnancy to early motherhood has shown a deeper understanding of the methods used by perinatal women to meet information needs and how information and support is provided by HCPs. Highlighting a postnatal gap in care has allowed the chapters in this thesis to be tailored towards examining this period further and assessing the role of technology as a supportive tool for postnatal mothers. The involvement of perinatal women and HCPs as key stakeholders demonstrated a perspective of how perinatal care is provided to women, how antenatal and postnatal appointments are structured and views on technology as an information and support tool for mothers. Findings from this thesis have formed a basis for further research to evaluating the implementation of technology in UK maternity services and to further examine the idea of a technology-based support tool designed for postnatal mothers to provide a space to record and share personal experiences of motherhood.

However, there are limitations to consider. Although this thesis has acknowledged the changing development of technology specific to UK maternity care, for example the Badgernet and eRedbook, the interviews with perinatal from chapter 3 (study 1) were conducted early into the implementation of these digital technology platforms in the UK, which had not reached Northeast England at the time of interviewing. Therefore, women interviewed during this study were asked to provide a perspective on the potential use of these tools rather than an actual user review. Although a longitudinal

case study approach (chapter 4) was taken with a sample of the mothers interviewed in study 1, this was mainly focused on journal use and postnatal information and support received in the firth six months after giving birth. To gain a further understanding of how women use Badgernet and eRedbook, a follow up study (once introduced in Northeast England) with perinatal women would have been useful to show how these digital tools are used and what the barriers and facilitators to use would be, this would also add to the current lack of literature in this area and to the findings of O'Connor et.al. (2016) and Sarre et.al. (2021).

To address further the role of technology-based support tools for new mothers, the design of the mobile app shown in chapter 7 (study 5) was based on images showing the potential features of the app rather than an actual working app. Not having access to a working mobile app may have altered how mothers viewed the ease of use and functionality of the app and though findings from this chapter were beneficial from a theoretical perspective, using an extended Technology Acceptance Model (TAM) (Davis, 1989), it would have given greater ecological validity if the app was a real working model. However, these findings provide a useful basis for further research examining the predictive factors to use a motherhood-based app using the TAM. Considering a stakeholder perspective, it would also provide useful findings if the HCPs interviewed through chapter 5 (study 3) were also given the opportunity to view the technology-based support tool to offer a health professional view on how this tool could be used in maternity services to enable improved support and information provided to postnatal mothers.

The main barrier identified to use of technology-based support tools identified throughout this thesis was privacy concerns. As mentioned earlier in this chapter, use of privacy policies could be beneficial to encourage mobile app use (Zhou et.al., 2019), however the motherhood app design shown to participants in study 5 (chapter 7) did not include this or information on how personal data would be managed on the app. Findings presented in chapter 7 (study 5) showed that privacy concerns were significantly predicted intention (plus) to use the mobile app for motherhood, as the design of the app did not contain information relating to privacy or data management, this may have increased the likelihood of raising privacy concerns when viewing the app design. Expanding on the findings of this study through future work it would be practical to include information relating to data sharing, including how and why the

information was stored and whether the information stored would be shared with any third parties. As well as privacy information, future research would also need to address the area of digital inclusion and ensure technology-based support tools were inclusive and available to all mothers. Key stakeholders involved would need to ensure the digital health literacies of new mothers using the mobile app, along with the digital based tools Badgernet and eRedbook to provide a service applicable to all mothers.

Although many novel findings and useful practice implications arose from this thesis, future research would need to address different populations of the UK to gain a more representative sample. Most perinatal women and HCPs (midwives and health visitors) interviewed through studies one to three of this thesis were based in Northeast England and although this was useful to reflect the current perinatal experiences of information and support in this region of the UK, a wider perspective from other UK regions would be beneficial to identify where perinatal care needs most improvement. The samples throughout this thesis have consisted of new mothers who had partners therefore did not explore the experiences of single mothers. This would be beneficial to include in future research to gain a perspective of single mothers and how they access support networks and their experiences of the provision of care from HCPs. Though the issue of digital inclusion has been discussed throughout this thesis, it was not specifically identified whether the perinatal women interviewed were from low SES backgrounds, however future research should acknowledge the perspectives of low SES mothers in the development of a technology-based support tool to examine the main barriers this population of mothers currently face and how this could be applied to their development to ensure inclusivity of digital technology to all women.

8.6. Future research

The main findings of this thesis led to the development of a technology-based support tool concept for new mothers as the postnatal phase was identified as the perinatal stage where women feel less supported and have largely unmet information needs. Further research is needed to develop this tool before being deployed as a practical tool for new mothers. As mentioned in this chapter, the design of the mobile app shown to new mothers as part of the questionnaire developed for study 5 (chapter 7) was based on concept images rather than a working prototype of the mobile app. Developing this further, having a working app that new mothers could test out to provide a true reflection of the features and functionality of the app could help to

provide an overview of what features would work well for new mothers and how the app could be improved to suit the needs of its potential users.

Prior to developing a working prototype of the motherhood based mobile app, it would be useful to examine further the implementation of digital technology currently available in UK maternity services. Literature examining the effectiveness of technology tools Badgernet and eRedbook is lacking with few studies evaluating current use of the tools and the perspectives of both mothers and HCPs in how they are affecting UK maternity care. Gaining a deeper understanding of the utilisation of digital technology tools would provide an additional basis for developing the motherhood focused mobile app as a combined tool implementing the key features of the eRedbook along with the journaling features outlined in studies two and five. As the perinatal women and HCPs interviewed throughout this thesis were only able to provide comments on potential use of digital technology tools, future research could involve exploring the perspectives on actual use of such tools, where they have been introduced in areas of the UK, to assess their effectiveness for both perinatal women and health care professionals.

Finally, to develop the findings of this thesis further, future research could expand on using the Technology Acceptance Model (David, 1989) in predicting use of digital technology support tools for maternity services for both HCPs use in healthcare practice and new mothers in a personal manner. Although findings from this thesis helped to expand on the theoretical based model and presented an extended TAM model applicable to health technology and specifically motherhood, there were issues identified with the constructs of the model, therefore this thesis has presented an alternative version of predictors specific to motherhood and a combined outcome variable. Future research using this model would help to further validate the findings. Although findings presented in chapter 7 (study 5) did not find significant findings of mothers age or whether they are first- or second-time mothers, future work could expand on this to add first- or second-time mothers to the extended TAM model to gain further evidence to which would show greater intention to use a mobile app designed for motherhood. This would assist in the development of the mobile app to ensure it is targeted at the most appropriate audience.

8.8. Final Conclusion

The primary aim of this thesis was to examine the information work undertaken perinatal women and to gain an understanding of how information is sought, stored and exchanged during pregnancy and postnatally, and to assess the role of technology as a form of information and support. Findings from this thesis have both met the aims and contributed to literature. Knowledge of how information seeking behaviours change across the timeline of pregnancy to postnatal has been expanded, and the studies throughout this thesis addressed a gap in care experienced by perinatal women specific to the postnatal stage. Focusing the direction of research in this thesis to the postnatal stage has allowed a greater understanding of how information and support is provided to new mothers from healthcare professionals and the longitudinal approach taken to study two has extended previous literature to show the changing information needs post birth and how contact with healthcare professionals diminishes during this time. Assessing the role of technology as a means of supporting information work has led to the development of a technology-based support tool designed to allow mothers to engage with self-reflection (as highlighted as a positive behaviour during this thesis) and potentially encourage the process of information exchange to allow more efficient postnatal visits and improved access to postnatal support services.

8.9. Reflexive statement

Alongside conducting the research included in this thesis, I experienced pregnancy and motherhood as both a first time and second time mother. The lived experience of being a perinatal women influenced how I shaped the research that I conducted throughout this thesis. Having experienced both the physical nature of pregnancy, birth and postnatal and having contact with my own maternity healthcare professionals, I used this lens to enable me to create the topic guides based on experiences I had encountered through my own perinatal experience and that of my social network also. This experience enabled me to build the interview schedules for the qualitative elements of this thesis and raise important questions to target how new mothers are receiving information and support throughout pregnancy and postnatally and how they are working with information from other resources to meet information needs.

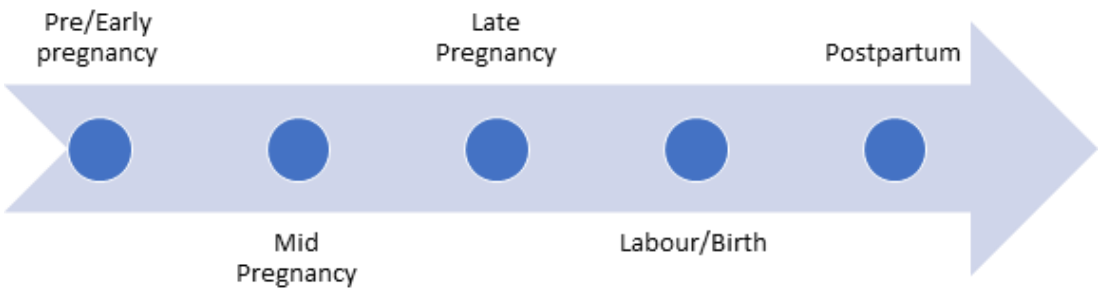
Whilst conducting interviews with new mothers, I took steps to remain objective and non-biased throughout for example using a developed interview schedule, and a

journal designed to encourage expressive writing as detailed in study 2 which was then used a prompt for interviews during the case study. Although I made efforts to remain impartial during the interviews, my lived experience of pregnancy and motherhood also offered me insight into how my participants were experiencing antenatal and postnatal care and as I could often relate to my participants this helped to establish a good rapport to encourage a positive interview process. Having personal experience of maternity healthcare also allowed me insight into how this may be viewed by other new mothers and assisted in the creation of the topic guide for the health professional interviews in study 3. As the sample of perinatal women recruited in study 1 and 2 were primarily Northeast England based, I could also reflect on my own experience of receiving antenatal and postnatal care in this region.

To ensure a rigorous approach to the qualitative research in this thesis was being maintained, my supervisory team also had input in the analysis process. This involved the principal supervisor and second supervisory independently reading a sample of transcripts from each of the interview cohorts (study 1, 2 and 3) and making a note of potential themes that could be reflected in from the interviews. The supervisory team and I had regular meetings to discuss findings from the qualitative research and ensured we agreed on created themes before including them in the final write up of the analysis.

Appendices

Appendix 1: Study 1. Perinatal timeline



Appendix 2: Study 1. Interview guide

Interview guide- Study 1

When you first discovered you were pregnant, what were your information needs?

what did you want to find out and where did you go to get that information?

Did you download any pregnancy apps at that time to get information from?

Did you use any social media/mum forum groups for information needs?

If you found information online, were there certain websites that you used?

what does pregnancy related information mean to you? (prompts- Is it things like personal stories, facts and figures, what draws you to certain types of information?)

Before you got pregnant, when you were trying to conceive if you were, did you do any information searching around that?

Did you download any fertility apps or anything then?

Do you feel like you did more (information searching) then than you did when you found out you were pregnant?

Were there specific dates throughout your pregnancy you feel you can gain access to information,so things that you might have needed, any burning questions you may have had?

Do you store any personal information on your apps, or is it generally about baby?

What sorts of information do you gain from your midwife, is it more verbal or does she provide you with written information like leaflets?

Do you feel like the information you get from your midwife is fulfilling?

Do you seek additional information elsewhere? So if your midwife gives you information do you look for it using other sources as well or just accept the information given?

Do you feel that the information provided to you has prepared you for pregnancy milestones? This could be things like labour or what to expect at scan dates?

Would this mostly be information provided to you by midwife or that you have found yourself?

Do you feel you have ample opportunity when you see your midwife to discuss information with her, or symptoms you may have experienced?

Do you feel that you've build up a good relationship with your midwife?

Which part of information provided to you do you find most useful related to your specific pregnancy and symptoms? As in information provided to you by your health provider.

Has your midwife given you any leaflets or any information on how you may feel in pregnancy or anything like that?

how do you feel about having access to your own medical notes? The book that you carry round with you through pregnancy?

What do you do with this information?

do you feel like it is your information and do you feel like you own it?

How do think it will feel giving it back when you've kept that information for 9 months?

who do you rely on most to provide your health information?

how important do you feel your relationship with your midwife, and any other health professional you may have encountered is for during your pregnancy and potentially after your pregnancy too?

What is your opinion on accessing online health information?

if you found something online, would you ask your midwife to check it?

Do you currently use online resources for personal information? And if so which do you use?]

Do you use mobile devices such as health apps to gain access to pregnancy information, foetal growth monitoring or symptom management?

Do you feel like you value the information more they give you about baby or the information it gives about you?

What aspects about the apps do you find most appealing?

Do you ever take the information that you've found on those apps and discuss it with your midwife or health provider?

Is there anything you would like to see or improve about a website in the way that you access information?

if there was an app which you could store your information on it and your midwife could store information it as well and you could use it as a communication tool. Would you use something like that?

Do you think it would help improve communication between you and your midwife?

Appendix 3: Study 1. Participant information sheet

Northumbria University
NEWCASTLE
Faculty of Health & Life Sciences

Study Title: Examining Health Information Seeking and Social Media use during Pregnancy and Early Motherhood

Investigator: Emma Kemp

Participant Information Sheet

You are being invited to take part in this research study. Before you decide it is important for you to read this leaflet so you understand why the study is being carried out and what it will involve.

Reading this leaflet, discussing it with others or asking any questions you might have will help you decide whether or not you would like to take part.

What is the Purpose of the Study

The purpose of the project is to examine current methods of information seeking and monitoring during various stages of pregnancy and early motherhood. This includes what online resources are used and if a digital or social media element is commonly used by pregnant women as a source of either information seeking or sharing. The aim of the project is to see if social/digital media can be incorporated into healthcare for information to be easily shared and monitored throughout pregnancy and early motherhood.

Why have I been invited?

You have been invited to take part in this study as you are either currently pregnant or have given birth in the past year therefore meet the inclusion criteria for the project.

Do I have to take part?

No, participation is entirely voluntary, and you have the right to withdraw from the study at any time by contacting the researcher.

What will happen if I take part?

You will be asked to take part in a one-to-one interview with the researcher, which will involve discussing your current information seeking customs, how you monitor and store this information and how it is shared between health professionals and other relevant bodies. You will also be asked prior to interview to keep track of how you have accessed pregnancy health information and what sources you have used in the form of an online diary, or by developing a Pinterest board. This will help to aid in discussion when meeting with the researcher.

What are the possible disadvantages of taking part?

As pregnancy and early motherhood is a personal time line of events, sharing information regarding these stages may be difficult. However, you will not be prompted to share anything you feel uncomfortable with and may ask the researcher to move on to a different question or end the interview at any point.

What are the possible benefits of taking part?

You will be taking part in the initial stages of a PhD research project that has future aims of developing a patient led digital information sharing source that can help to improve communication with health professionals during pregnancy and early motherhood.

Will my taking part in this study be kept confidential and anonymous?

Yes. All information given will be kept confidential and the write up of the study will include participant codes, so participants remain completely anonymous in the data. Only the researcher and her supervisor will have access to participant information.

How will my data be stored?

All information given to the researcher will be stored in a lock cabinet, until after the write up of the research where all information will be destroyed.

What will happen to the results of the study?

The results of the study will form as part of the first chapter of the researchers PhD thesis. Data from the study may also used for published papers.

Who is Organizing and Funding the Study?

The researcher is organizing and funding the study.

Who has reviewed this study?

The study has been reviewed by the supervisor of the research Dr Liz Sillence and has been given full ethical approval from the Faculty of Health and Life Sciences ethics committee.

Contact for further information:
Researcher email: emma.j.kemp@northumbria.ac.uk

Name of another person who can provide independent information or advice about the project
(Elizabeth.sillence@northumbria.ac.uk)

Appendix 4: Study 1. Example of codes from analysis

Informed decision making
Opinions of others

Judgements about breastfeeding

Taking control of own parenting decisions

Good communication with midwife

Conflicting information online and offline

Trusting own instincts

Social media use prompts further information seeking

Early pregnancy- information needs baby focused

Using non medical online sources for lifestyle information

Storing personal information

Preparing for post partum during pregnancy

Unhelpful practitioners with negative pregnancy symptoms

Unwanted overload of information on apps

Ease of accessing information online

Too much information online

Pregnancy notes made digital

Appendix 5: Study 2. Interview guide (case study)

New mum journal questions

1. How have you found using the new mum journal?
2. How do you feel about having a diary which you can store personal information about motherhood/ as opposed to baby record book?
3. Thinking about all types of information, (including photos, websites looked at, written information, diary entries) what have you found most useful relating to yourself?
4. What do you think the benefits of using the new mum journal as a paper copy? (Privacy, ownership of information, personal information)
5. Would you prefer/ use a digital version of the journal? (if not, why?)
6. What information would you want to store in the journal but not able to? (space, time, privacy)
7. Is the information you keep in the journal something you would keep separate from what you share online?
8. Is the information you share via social media more baby focused?
9. Who would you share information from the journal with?

Postpartum information seeking behaviours and needs questions

10. Since giving birth, what have you wanted to find out? About baby and about yourself.
11. Who or what have you relied on most to provide this information?
12. Have you accessed information online about baby/postpartum recovery?
13. Did you discuss any information found online with your midwife/health visitor?
14. Have you used social media to seek advice/information about baby/postpartum related issues?
15. Has the information and support you have received from health professionals been tailored more towards baby or you?
16. When your midwife visited your home, were you able to speak to her about any challenges or worries you were facing about being a new mum?
17. Were you able to discuss mental and physical wellbeing with your midwife?
18. Would you discuss this personal information more with friends/family or health professional?
19. Has the information provided to you by health professionals been written or verbal?
20. What have you taken from the information provided?
21. How have you stored this information?
22. How did you feel when you returned your pregnancy folder?

23. Did you take any copies of the information stored in your folder? If so, which parts?
24. What information have you stored about baby? (photos, hospital letters, hospital bands/baby journal?)
25. Who have you shared this information with? (friends/family, health professionals, social media?)

Appendix 6: Study 2. Template analysis tables

Template analysis

Themes	
Paper based journal benefits	Cathartic writing process
	Weekly pages preferred
	Useful to store mum and baby information together
	Therapeutic to reflect on week with baby
	Helps to focus on good points of the week when struggling with baby
	Moment to pause for mum to write in journal
	Setting aside time for myself to write in journal
	Nice to look back over the previous week with baby
	Committed to writing as unable to edit/erase it
	More likely to share personal info in paper version
	Feels more secure- no digital privacy issues
	Paper version preferred
	Early postnatal mum wrote more info in journal about herself then from month 2 more about baby
	Would like journal to continue to 6 months postnatal
	Having record of information easier to present to HCPs
Sharing information from journal	Willing to share with close family/husband
	Would only share information about baby with wider family
	Would share information with HCPs but not in 'dear diary format'
	Sharing information about postpartum recovery in early stages
	4 months+ would share info with nursery nurses or HCPs involved with children

Storing information after journal	Information stored on phone – baby photos, or milestones e.g baby rolling over
	Less information stored about mum
	Would liked to continue with journal writing info about 'how mum is feeling'
	Baby record books
Useful information sources early postnatal	Student midwife contacted for information about postnatal recovery
	Internet sources mainly used for gathering information
	Talking to friends and family
Potential benefits of digital mum journal and additional features	Not as easy to lose as paper diary
	Quick and easy to access
	Editing option if mistake was made
	Can input more information/more space
	Option to add photos from phone
	Include baby milestones to expect
	Reminders as pop ups 'registering birth etc.'
	Local baby classes to attend
	Easier to write in when baby is sleeping on mother
	From month 2 onwards, participants stated digital version would be preferred over paper
	Including calendar in digital version would help to keep track of weeks and activities
	Mum information- period tracker to check periods are returning to normal post birth
	Easier to share information with HCPs as it would be easy to access
	Jot down snippets of information and attach pictures
	Negatives- Potential privacy issues, trust of secure information
Posting personal information on social media	Photo sharing about daily activities
	Not willing to share personal information about mum and baby
	Privacy issues surrounding social media
	Instagram stories- will post photos using this feature due to disappearing after 24 hrs function
App use for postnatal/baby milestones	Wonder weeks- baby 'leaps'- information on development milestones to expect with baby each week post birth

	Sharing the information from app with family
	Would include this information in a digital 'mum journal' – screenshots
	Lunami- photo editor for sharing photos on social media
	Baby centre- updates on baby development week by week post birth
	Family Wall- family organiser accessed by all family members- digital, easy to share info.
Mixed level postnatal HCP support for both case studies	Breastfeeding issues- not contacted by breastfeeding coordinator
	Health visitor unhelpful until after ended breastfeeding
	Health visitor did not provide information about baby struggling with wind pains
	Consulted internet for information instead
	Breastfeeding support worker helpful for participant 2
	More supportive health professionals encourage sharing of personal information
Postnatal information needs	Recovery from birth
	Reluctant to seek advice from GP
	Postnatal depression- feeling low and anxious
	Using internet resources first to find answers
	Hoped for information given about baby blues
	Asking family and friends for advice about motherhood
	For baby- are they hitting the right milestones
	Friends and family first contact for information about mum, not a HCP
	4 months+ baby development, teething, reactions to injections, some physical concerns with mother and postnatal recovery
Postnatal midwife visits	Focused on baby
	Lack of support given to mother
	Mother did not feel able to share postnatal struggles
	No physical checks done on mother (checking stitches)
	Few questions asked about mothers wellbeing
Relationship with Health Visitor	More leaflets provided by HV
	HV not focused on mum so reluctant to ask about postnatal recovery

	Feeling uncomfortable asking HV about mood changes
	Did not know her well enough to ask for feeding advice
	Conflicting information given from HV
	Trust HV to provide advice about medical concerns for baby
	More contact over time builds a better relationship- information exchange encouraged
	Feeling judgement from HV when asking about mum
	Not enough contact with HV to build a good relationship postnatal
Social media to seek information	Forums/ breastfeeding group/ Instagram to seek advice from other new mothers
	Seeking information about baby
	Social media use to communicate with other mums
Relationship with red book	Information for HCPs
	Too much information included and not formatted well
	Digital version would be easier to find information
	HV and breastfeeding support worker write notes from visits in red book
	Mums use red book mainly for weight tracking
	Digital/app version would encourage mother to store personal information (if categories were available)
	Digital version easier to separate information from mum and baby- specifically for sharing with others
	See book as tool for HCPs no personal ownership
Seeking information directly from HCPs	If medical and urgent then GP would be contacted for baby
	Non- medical issues for baby often wait for health visitor appointments
	Conflicting information and advice given from different HCPs
	Consulting midwife for information early postnatal
	4 months+ willing to share information with HCP even if no prior relationship has been built up

Postnatal contact with HCPs	6 week postnatal check up with GP
	6 week health visitor weigh in/check up (home)
	Injection at GP practice
	Breastfeeding support worker stopped visits 2 months postnatal (p2)
Fathers/Husbands role in supporting postnatal mother	Sharing the information in journal
	Provide emotional support
	Would ask question to HCPs that mother reluctant to ask
	Uninformed what to expect early postnatal e.g baby blues
	New dad's would benefit from some information how to support the new mother
	HCPs do not direct any questions at father during home visits
Baby groups attended	Baby massage/ swimming/ baby yoga/
	Advertised on social media
	Bambinos- ran by health visitor, information for mums including weaning
	Meet new mums at baby classes- staying in touch through social media
Reflecting on motherhood at 6months postnatal	Early on, more support is provided from HCPs then 'fizzles out'
	Need to seek out support from HCPs now, rather than it being offered in the beginning
	Lack of continuity of postnatal HCPs
	Less reliant on medical professionals to provide answers
	Trusting self a bit more with child- not seeking medical advice straight away for minor issues
	NHS website and Facebook messenger to contact friends and family are most used information sources
Future Technology ideas	Robot helpers- to organise your time • To provide immediate answers (Alexa style healthcare assistant) • Ability to contact most appropriate health professional to give advice • Ask questions that wouldn't need HCP assistance on, a live Google

	• Could book appointments for you • Would improve communication with HCPs • Would arrange appointments for things such as smear tests • Voice reminders Something to put mind at rest- not overload of information Easy access to HCPs Speak to someone in person is most helpful Communication device to seek HCP information or advice straight away Via videolink- helps to see somebody 'Health professional facetime'

Potential Themes
Paper based journal benefits
Sharing information from the journal
Sharing information after journal ends
Useful information sources early postnatal
Potential benefits of digital mum journal and additional features
Social media to seek information
Postnatal information needs
Relationship with red book
Postnatal midwife visits
Relationship with health visitor
Posting personal information on social media
App use for postnatal/baby development milestones
Mixed level postnatal HCP support for both case studies
Seeking information direct from HCPs
Attending baby groups
Father/Partners role in supporting new mother
Reflection on motherhood at 6 months postnatal
Future technology ideas

Appendix 7: Study 3. Participant information sheet and consent form

Northumbria University
NEWCASTLE
Faculty of Health & Life Sciences

Study Title: A health professional perspective: support, technology use and information exchange with pregnant/postpartum mothers

Investigator: Emma Kemp

Participant Information Sheet

You are being invited to take part in this research study. Before you decide it is important for you to read this leaflet so you understand why the study is being carried out and what it will involve.

Reading this leaflet, discussing it with others or asking any questions you might have will help you decide whether or not you would like to take part.

What is the Purpose of the Study

The purpose of the project is to examine the health professional perspective on the role of technology use to support new and expectant mothers, importance of relationships and information seeking and sharing practices during pregnancy and postpartum. This study will build upon two previous studies, both of which have looked at the perspectives of new and expectant mothers and how their relationships with health professionals throughout pregnancy and early motherhood can alter information seeking habits and prepare women for milestones throughout the pregnancy/postpartum phase. The role of technology will specifically be looked at and how this is viewed from health professionals as a tool for filling information gaps between appointments.
The aim of the project is to see if social/digital media can be incorporated into healthcare for information to be easily shared and monitored throughout pregnancy and early motherhood.

Why have I been invited?

You have been invited to take part in this study as you are either a trainee, qualified or retired midwife or health visitor and have/had contact with pregnant and postpartum mothers.

Do I have to take part?

No, participation is entirely voluntary, and you have the right to withdraw from the study at any time by contacting the researcher.

What will happen if I take part?

You will be asked to take part in a one-to-one interview with the researcher, which will involve discussing your professional practice following a semi-structured interview schedule. You will be asked to describe a general appointment with pregnancy/postpartum mothers, your perspective on technology to assist in information seeking and sharing throughout this time frame and the general structuring of home visits and how the transition from pregnancy to motherhood is undertook. Interviews will last approx.. 1 hour and will be recorded.

What are the possible disadvantages of taking part?

No possible disadvantages are identified by you taking part in this study. The researcher appreciates you taking the time outside of your working/training/personal time to participate. You will not be required to any questions you do not feel comfortable answering.

What are the possible benefits of taking part?

You will be taking part in the third study of a PhD research project that has future aims of developing a patient led digital information sharing source that can help to improve communication with health professionals during pregnancy and early motherhood.

Will my taking part in this study be kept confidential and anonymous?

Yes. All information given will be kept confidential and the write up of the study will include participant codes, so participants remain completely anonymous in the data. Only the researcher and her supervisor will have access to participant information.

How will my data be stored?

All information given to the researcher will be stored in a lock cabinet, until after the write up of the research where all information will be destroyed.

What will happen to the results of the study?

The results of the study will form as part of a chapter of the researchers PhD thesis. Data from the study may also be used for published papers.

Who is Organizing and Funding the Study?

The researcher is organising and funding the study.

Who has reviewed this study?

The study has been reviewed by the supervisor of the research Dr Liz Sillence and has been given full ethical approval from the Faculty of Health and Life Sciences ethics committee.

Contact for further information: **Researcher email: emma.j.kemp@northumbria.ac.uk** **Name of another person who can provide independent information or advice about the project (Elizabeth.sillence@northumbria.ac.uk)**

Appendix 8: Study 3. Interview guide (HCPs)

Interview schedule: Midwife

First meeting

Can you describe to me how you approach that first meeting with a client?

- What are the key expectations of that first meeting?
- What are you looking to achieve, what do you need to get done?
    - Medical/ Information gathering
    - Developing the relationship

During the pregnancy

Can you tell me about the general timeline to your meetings antenatal meetings? How many meetings usually take place, what happens at these meetings?

- How would you say your relationship with your client develops over the course of those meetings/the pregnancy?
    - Contact and trust
    - Information gathering
- How do you approach mums who talk about the internet/social media as their sources of information?
- Do you advise mums on any mobile app/websites trusted by health professionals? (baby buddy)
- Can mums contact you outside visits?
  What's the main reason(s) mums to be contact you in this way?

Post-birth and handover

Can you describe to me a typical post birth visit? What kinds of things are important from your perspective?

- Baby focused or mum focused?
- Other stakeholders (dads, other experts)
- A focus on postpartum mental healthcare?

Can you describe to me how you handover to the health visitor at 10-14 days postpartum?

a. What information/concerns are flagged?

b. What do you do if you have concerns or think there may be issues?

Information gathering and exchange

Current: pregnancy folder and red book

When you take back the pregnancy folder with a mums personal information, what is done with this information?

- How do mums tend to feel about the pregnancy folder?

Can you describe how you use the red book with new mums?

What's its value to you and to mum?

Who do you feel the information in pregnancy folder/red book belongs to?

It's being digitised in the next few years – what challenges and opportunities do you see this presenting?

Future:

We are thinking about a mobile app where new mums could write down experiences of motherhood or postpartum symptoms. A recent study we ran involved giving two new mums a journal where they could input this kind of information and any additional struggles or positives they were facing in motherhood.(**Show page from journal and explain what new mums were asked to share)** This might be something that they could share with you or choose to share certain pieces of information. As we hope to design this as a digital version we would like your thoughts on the idea.

Initial reactions:

Positives: value to mums?

What might be shared?

Improvements to sharing/communication? If any? If not, why?

Can you envisage any danger re: this kind of system?

Interview schedule: Health Visitor

Meeting the pregnant woman/client- how is the first meeting arranged and what are the key information points given to mother? What are they hoping to gain from the first meeting

Prior to the first visit

How do you handle the sign-off from midwife to health visitor? What happens?

- Exchange of information
- Cause for concern
- Making contact with a new mum

Planning for the visit? What do you do?

When you initially meet with a mum during pregnancy, how is this visit structured?

- Do you already have information about the mum/family beforehand?
- What are the key expectations of that first meeting?
- What are you looking to achieve, what do you need to get done?
  - Medical/health versus relationship building

Earlier Visits after birth

Information exchange

What information do you provide to a new mum during the first postpartum visit?

- Tailored vs generic

How do you encourage a mum to share personal information with you?
Can you give me an example of an easier home visit and how that compares with a more difficult home visit?

- Explore special circumstances (Multiples/safeguarding issues etc.)
- Who decides how many visits to allocate to each mum? (team meetings, case load, special cases)

Later visits

Can you describe what happens during the last visit with new mum/baby?

- How do you gauge that everything is ok? With mum/with baby?

What do you do if this last visit suggests there are still issues?

- Mum or baby?

Relationships and support

In terms of the key information and other information that you think might be important/relevant to supporting mum and baby…
What kind of support do you/can you offer to a new mum who was **struggling** with postpartum mental health or physical recovery?
During home visits, do you speak to mum alone or with dad/partner present?

- Explore importance of trust and relationship building

How do you approach mums/parents who talk about the internet/social media as their sources of support?
How much of your role is about providing information and support to new mums versus gathering information from mum/baby to monitor baby's health etc.

Red book

Can you describe how you use the red book with new mums?

- What's its value to you and to mum?
- Who do you feel this information belongs to?
- It's being digitised in the next few years – what challenges and opportunities do you see this presenting?

Future:

We are thinking about a mobile app where new mums could write down experiences of motherhood or postpartum symptoms. A recent study we ran involved giving two new mums a journal where they could input this kind of information and any additional struggles or positives they were facing in motherhood. **(Show journal page to explain what information mums shared**). This might be something that they could share with you or choose to share certain pieces of information. As we hope to design this as a digital version we would like your thoughts on the idea.

Initial reactions:
Positives: value to mums?
What might be shared?
Improvements to sharing/communication? If any? If not, why?
Can you envisage any danger re: this kind of system?

Appendix 9: Study 3.Sample of interview notes

Health visitor (retired)

- Good relationship with midwife- antenatal classes ran together

- First meeting with client- offering a service with an element of surveillance, available to all families not just those with issues. Service is for whole family not just mum and baby.
- First meeting- providing information on local services and forging a partnership- honest about what to expect from service, negotiate a visiting pattern which suits mum, explain record keeping (red book)
- Verbal communication with midwife for handover (one information sheet passed over about labour and condition of baby at birth).
- Information provided – baby focused (immunisations, back to sleep, child development, clinics and baby groups in area) – more about providing information to mother for baby.
- Important to build relationship with mother and have a rapport with family.
- Special support offered to mothers of twins
- Mental health checks- Edinburgh depression inventory given, assess mother personally (ask about sleeping, eating) Raise topic on each visit.
- Visits until good relationship established (point to when mother feels comfortable ringing up with concerns), keep mother informed of when to expect visits.
- Last visit- when child is aged 3 ¼ records are reviewed and hand over to school nurse.
- Online information- open to discussion of things found online, builds the relationship however would refer to trusted sources e.g. NHS
- Redbook- working together with the family, encourage mothers to write in it too, keeping a record of visits.
- Digital red book thoughts- Issues- screen could get in the way of you and client, could affect the relationship? Who is sharing the information, privacy concerns. Positives- could be useful to track sleep and feeding issues, use as a starting point for helping build rapport.

Midwife (retired)

- Booking appointment- information given, choice of hospital, information leaflets, outline of care and availability of midwife up until delivery.
- Assigned a named midwife- should see this midwife for the remainder of pregnancy
- Drop in service available for additional support
- Booking appointment- usually around 8-10 weeks, starting off notes gaining information about previous pregnancies, health history etc.
    - Info provided, leaflets given out (e.g. what testing is offered for baby)
- Info sent to hospital and backed up, pregnancy notes kept on file for 25 years.
- Appointment structure (before 2010)- ladies are seen at 16,20,24,28,30,then two weekly until 36 then one weekly until 40 weeks.
- Postnatal visits (before 2010) – mums would usually stay in hospital longer, midwife would visit everyday until day 6 for Guthrie test, care usually ends on day 10- mothers are asked if they want any further visits.
- Good relationship build up with mothers
- Concerns arise from booking- social services referrals in place
- Closely work with health visitors- any concerns would be flagged to them
- Twin pregnancy would be monitored by GP

- Information found online- not many google questions, midwife would hope to provide enough relationship for questions to be asked direct to her
- Information provided was mainly written but some websites referred to included NHS and NICE (Official sources)
- Breastfeeding support offered antenatally and postnatally, breastfeeding coordinators now available.
- Post birth visit- mum checks- how is mum feeling, sleeping, resting, breastfeeding, fundal height, blood loss, stitches, legs for swelling, baby- top to toe checks.
- Visits focused on both mum and baby
- Mental health- mothers informed that day 3 or 4 milk comes in, might feel extra emotional, concerns about mental health flagged with GP and Health Visitor.
- If a good relationship is build up, there is trust between mum and midwife (easier for mum to share personal information)
- Handover to health visitor- info sheet handed over.
- Pregnancy notes- sent to unit and filed, backed up and kept for 25 years.
- Mums didn't query notes being taken away- legislation for midwives, proof of care, everything kept confidential.
- Red book- filled in when baby is born and last visit, hearing checks, weight, and sign over documented.
- Digital red book thoughts- prefer paper version ('old fashioned'), kept safe (could get accessed by others online?), keepsake for mum, may take away the human aspect- prefer to talk to mums direct, journal aspect is good and nice for mum to have a record- digital version would appeal more to new midwives.

Midwife (Newly qualified)

- Booking appointment- first contact with midwife
- - getting information from patient- health conditions, BMI, high risk factors, previous pregnancies, determine if extra support needed
- If high risk- consultant appointment between 12-16 weeks and more regular appointments throughout pregnancy.
- Booked by midwife at own practice- relationship building from 1st appt- subsequent appointments easier because you know background info on the patient.
- Partner asked to leave on discussion of sensitive topics
- Concerns raised- referral to childrens services, domestic violence support worker
- Timeline of antenatal appointments-

_- Booking 8-10 weeks, (scan 12 weeks), 16, 25, 28, 31,34,36,38 and 40 weeks (first pregnancy)- second+ pregnancies not seen at 25 or 31 weeks.

- If patients require extra support e.g. women who have experienced pregnancy loss offered more appointments- reassurance checking baby's heartbeat.
- Structure of appointments- ask how they are feeling, urine dipped, BP taken, Co2 reading, how baby is lying, listen to baby's heart beat- more focus on the mum.
- Seeing patient at every appointment develops good relationship- good to have continuity of care.

- Information provided at appointments- more verbal but steering towards written for legislation – documenting info to give to patients. Info provided on safe sleeping, when to go to hospital etc.
- Safe sleeping info given at 16 weeks.
- Information found online- would direct patient to trusted sites e.g. lullaby trust, Tommy's- would prefer to ask midwife than google things. Patients informed that pregnancy assessment open 24hr for any questions/concerns.
- Covid-19 changes- 16 and 25 week appointments changed to telephone appointments- not seeing a midwife f2f – may make patients rely on google more, appointments over the phone could be rushed.
- Information provided on labour and birth- 36 weeks birth plan discussed, questions asked to mother- would you be happy with a student present, what paint relief do you want, can baby have vitamin K when born

- information leaflet given what to pack in hospital bag, number of birth partners allowed, questions about induction process.

- Midwives find that patients would like the same midwife at delivery who they have seen throughout pregnancy- gained a relationship with midwife, those part of continuity team are happier they have seen same midwife all the way through pregnancy.
- Post birth visit- home visit on day after mum and baby leave hospital, visit on day 5 for blood spot test, day 10 final visit and handover to HV. Some mothers require additional appointments.

- structure- mum check, how mum is feeling, ask about bleeding, feel uterus, check medication, assess general wellbeing.

- baby check- is baby feeding 3-4hrly, breastfeeding checks (latch), may need breastfeeding assessment, top to toe check of baby. Answer any q's mum has.

- Breastfeeding support available in Northumberland
- Visits tailored towards mum and baby.
- Baby blues mentioned at hospital- signs to look out for and what is normal
- If women have seen the same midwife they are more open to discussing mental health concerns, having good relationship with mother makes it easier to pick up on signs mum might not be coping well.
- Last appointment usually 10 days but care offered up to 28 days post birth
- No verbal handover to health visitor, just a sheet filled out and passed on
- Mums don't appear affected by pregnancy note being taken back, notes are sent for backup and kept on file.
- Use of red book- registering baby with an NHS number, put a birth registration form in, stickers put in for blood spot tests, form to say midwife weighed baby, day 10 discharge.
- Digital version would be easier to manage- some get too full of paper, difficult to find information- digital format would keep information tidy, a lot of unused information in the paper red book

-challenges- patients who don't have access to the internet

- Safety issues- who would have access to it and how it would be accessed, password protected?
- Digital new mum journal thoughts- midwife could read up on what mum was struggling with beforehand, would help prompt them to ask questions, could use journal as prompt to mums who were struggling to ask questions

- could help improve communication- especially if you have visits from different midwives, they could read up beforehand and know information about the mother prior

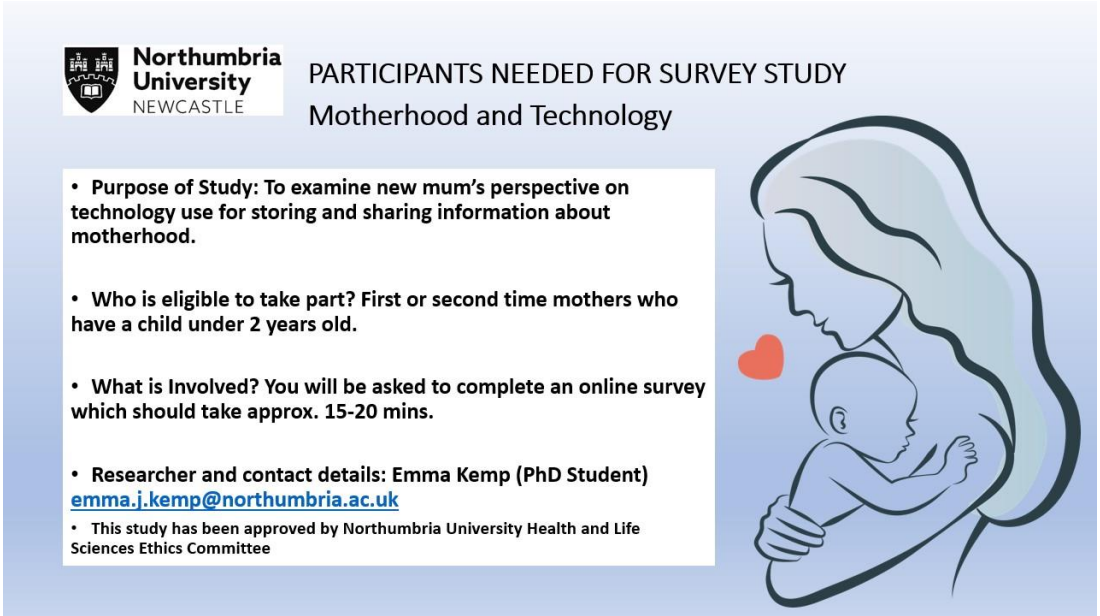
Appendix 10: Study 3. Example of codes from HCP interviews

Written information provided to client
Written information provided for legislation and proof of care
Trial of continuity of care from pregnancy, delivery to postnatal
Tracking information to present to midwife from journal
Timeline of antenatal appointments from 2020
Time limits on appointments at clinic, less time to provide throrough information
Telephone service for advice and support- HV
Telephone appts due to Covid-19 may result in greater reliance on digital information seeking
Support offered to both mother and baby
Support offered between appointments
Support offered antenatally for expectant mothers
Storing of pregnancy notes post birth
Storing of patients information post appointment
Specific information provided at time points of the pregnancy
Signposting clients to trusted information sources
Sharing clients information with other HCPs
Setting up expectations of HV service initially
Service provided to patients between appointments for access to midwife
Routine visits from HV

Appendix 11: Study 4. Functionality analysis of apps

Feature	Glow Baby Tracker	Babycentre	Emma's Diary	OVIA Parenting	Baby Sparks	Wonder weeks	Kinedu	Bounty	LactApp-Breastfeeding expert	Mindful Mamas	Mamazen	Mush	Peanut	Tinto	Baby+ (pregnancy+)	What to expect	iMumz	Baby daybook	Baby Buddy	Huckleberry		
Tracker feature (sleep, feeding)	*			*		*	*	*	*						*	*		*	*	*	11	55%
Inputting information about baby (photos, notes, milestones,growth)	*			*	*	*									*	*		*	*	*	9	45%
In app purchases	*				*	*	*			*	*				*			*		*	9	45%
Information specific to mother									*	*	*	*	*	*	*	*	*		*		10	50%
Daily articles	*	*	*	*	*		*	*	*	*		*		*	*	*	*		*		15	75%
Summary charts for baby	*						*		*						*	*		*	*	*	8	40%
Community- connect with other mothers (forum style feature)	*	*		*								*	*	*		*	*				8	40%
Memories – upload photos of baby and add stickers	*	*		*		*	*					*			*			*	*		9	45%
Categories for Baby, Toddler, Pre-school-tailored information		*	*			*	*	*	*						*	*	*				9	45%
Podcast			*										*								2	10%
Offers and Coupons			*					*													2	10%
Registering to access app/additional features	*		*	*			*	*	*	*	*	*	*	*	*	*	*		*	*	16	80%
Sharing with family and friends feature (admin)	*			*			*						*					*	*		6	30%
Daily activities to do with baby		*			*	*	*						*		*	*	*				8	35%
Online baby classes(information)					*		*														2	10%
Apppointments and hospital information								*							*				*		3	15%
Activities for mother (mindfulness)										*	*						*				3	15%
Mood tracker for mums											*			*							2	10%
Approved by health and wellbeing professionals		*	*			*					*	*		*			*		*		8	40%

Appendix 12: Study 5. Recruitment Advert



Appendix 13. Study 5: Participant information, consent, survey items and debrief

Participant Information Sheet

You are being invited to take part in this research study. Before you decide whether to take part it is important for you to read this leaflet so you understand why the study is being carried out and what it will involve. Reading this leaflet, discussing it with others or asking any questions you might have will help you decide whether or not you would like to take part.

What is the purpose of the study?

The purpose of this study is to gain the perspectives of new mothers on a potential new App tailored towards providing information relating to postnatal physical recovery and symptoms, mood and experiences of motherhood. Topics such as ease of use, usefulness and social support will be assessed in relation to use of the App. This study builds on previous studies where new mothers have discussed using Apps relating to pregnancy and motherhood. The aim of the study is to look at what factors will influence intention to use a new mum App.

Why have I been invited?

It is important that we gain perspectives from first or second time mothers to understand their views on the use of technology for storing and sharing information and the use of a potential new App for motherhood. Therefore participants are required to have experienced new motherhood to provide accurate judgement of usability of the new App. You fit the criteria for the study as an adult aged 18+, and have a child 2 years old or under.

Do I have to take part?

No, participation is entirely voluntary, and you have the right to withdraw from the study at any time by contacting the researcher. You may withdraw from the study during participation or after participation, by contacting the researcher who will remove and discard your data.

What will happen if I take part?

You will be asked to read a short scenario and then complete a survey which will last approximately 15-20 minutes. After providing online consent, the survey will begin. When you have completed the survey, you will be presented with a debrief form explaining the nature of the research, contact details for finding out the results and information regarding withdrawing your data from the study.

What are the disadvantages of taking part?

No possible disadvantages are identified by you taking part in this study. The researcher appreciates you taking the time outside of your personal/working time to participate. You will not be required to any questions you do not feel comfortable answering.

What are the possible benefits of taking part?

You will be taking part in the fifth and final study of a PhD research project that has future aims of developing a patient led digital information sharing resource that can help to improve communication with health professionals during pregnancy and early motherhood.

Will my taking part in this study be kept confidential and anonymous?

Yes. Your name will not be identified on any data we collect, you will be asked to generate a personal code word that is memorable should you need to access your data or withdraw it. Your signed consent form will be kept in a secure cloud-based storage and kept confidential.

How will my data be stored, and how long will it be stored for?

All electronic data will be stored on the University U drive, which is password protected. All data will be stored in accordance with University guidelines and the Data Protection Act (2018). All information and data will be stored for a period of 3 years in line with the university retention schedule.

What categories of personal data will be collected and processed in this study?

You will be asked to provide data including your age, age of your child and if you are a first or second time mother. No other personal data will be required. All personal data will be kept confidential.

What is the legal basis for processing personal data?

The legal basis for processing regarding GDPR requirements that the processing of this study is necessary to perform a task in the public interest.

Who are the recipients or categories of recipients of personal data, if any?

All data from this study will be processed by the researcher and supervisor, no other parties will be involved with the processing of data.

What will happen to the results of the study and could personal data collected be used in future research?

The general findings might be reported in a scientific journal or presented at a research conference, however the data will be anonymized and you or the data you have provided will not be personally identifiable, unless we have asked for your specific consent for this beforehand. We can provide you with a summary of the findings from the study if you email the researcher at the address listed below. If the data collected in this study is used for future research your personal identifiable data will not be passed on and kept confidential and stored for the period outlined above.

Who is organising and funding the study?

The organizer of this research is Northumbria University, the study has received no external involvement or funding.

Who has reviewed the study?

The research project, submission reference 45985 has been approved in Northumbria University's Ethics Online system. It has been reviewed in order to safeguard your interests, and have granted approval to conduct the study.

What are my rights as a participant in this study?

As a participant your rights are protected under GDPR law and can be accessed at the following link Your data matters | ICO You have a right to access a copy of the information comprised in your personal data (to do so you will need to submit a Subject Access Request);You have a right to have inaccurate personal data rectified; and a right to object to decisions being taken by automated means. If you are dissatisfied with the University's processing of personal data, you have the right to complain to the Information Commissioner's Office. For more information see the ICO website.

Contact for further information:

Researcher email: emma.j.kemp@northumbria.ac.uk

Supervisor email: elizabeth.sillence@northumbria.ac.uk

Name another person who can provide independent information or advice about the project: Dr Liz Sillence

Name and contact details of the Records and Information Officer at Northumbria University: Duncan James (dp.officer@northumbria.ac.uk).

You can find out more about how we use your information at: www.northumbria.ac.uk/about-us/leadership-governance/vice-chancellors-office/legal-services-team/gdpr/gdpr---privacy-notices/ or by contacting a member of the research team

Electronic consent form

Consent form If you would like to take part in this study, please read the statement below and click 'I agree'

I understand the nature of the study, and what is required from me. I understand that after I participate I will receive a debrief providing me with information about the study and contact details for the researcher. I understand I am free to withdraw from the study at any time, without having to give a reason for withdrawing, and without

prejudice. I agree to provide information to the investigator and understand that my contribution will remain confidential. I also consent to the retention of this data under the condition that any subsequent use also be restricted to research projects that have gained ethical approval from Northumbria University.

o I Agree (1)

Q19 Please create a unique memorable code word

_____

Vignette

Q5 We are interested in understanding more about how mothers feel about technology use for accessing and sharing information about 'Motherhood'. Please consider the following scenario:

Anna is a 28-year-old new mother to a 6-week-old baby. Anna has downloaded a 'New Mum Journal App' onto her mobile phone which has been designed specifically focusing on motherhood. The aim of the App is to provide a space for new mothers like Anna to record their information about their postnatal recovery and symptoms, mood, and daily experiences of being a new mum. Anna can upload photos of her new baby and activities they do together whilst also keeping track of her baby's milestones. Acting as a new mums' journal, Anna uses the App to reflect on issues such as postnatal mental health, physical birth recovery and any concerns she has, whilst also recording activities and experiences she has being a new mum. Anna uses the App as both an information resource and as a tool to prompt conversations between herself and health professionals relating to her motherhood journey and caring for her newborn child.

Perceived Usefulness

Q8 Thinking about the App, we would like you to consider and rate the following statements

Strongly disagree (1) Disagree (2) Somewhat disagree (3) Neither agree nor disagree (4) Somewhat agree (5) Agree (6) Strongly agree (7)

Using this App would make me feel better about myself (1)

The use of this App would increase my peace of mind. (2)

I would find it useful to have an App that allows me to store my personal experiences of motherhood and postnatal recovery (3)

The existence of this App would raise the awareness of my own health and wellbeing (4)

Perceived Ease of use

Q9 Please answer the following based on use of the App

Strongly disagree (1) Disagree (2) Somewhat disagree (3) Neither agree nor disagree (4) Somewhat agree (5) Agree (6) Strongly agree (7)

I think the interaction with the App would be clear and understandable (1)

I think that learning to use the App would be very easy for me (2)

I think I would quickly become skilful at using the App (3)

It would be easy for me to navigate my way around the App (4)

Intention to use

Q10 Please answer the following based on use of the App

Strongly disagree (1) Disagree (2) Somewhat disagree (3) Neither agree nor disagree (4) Somewhat agree (5) Agree (6) Strongly agree (7)

I would try and use this App in my daily life (1)

I would intend to continue using this App in the future (2)

I would intend to continue to use this App frequently (3

Privacy concerns

Q11 Thinking about potential barriers to using the App, please rate the following

Strongly disagree (1) Disagree (2) Somewhat disagree (3) Neither agree nor disagree (4) Somewhat agree (5) Agree (6) Strongly agree (7)

I am concerned that information from the App may be used inappropriately (1)

I am concerned that someone else may find out private information about me (2)
o

I am concerned that the information provided to the App may be used by other people or companies (3)

I am concerned about providing personal information to the App service provider because it could be used in a way that is not intended (4)

Trust

Q12 Thinking about how this App might make you feel, please rate the following

Strongly disagree (1) Disagree (2) Somewhat disagree (3) Neither agree nor disagree (4) Somewhat agree (5) Agree (6) Strongly agree (7)

This App gives me confidence (1)

This App will keep its promises (2)

This App would take into account the interests of it's users (3)

Attitudes

Q13 Considering potential benefits of the App, please rate the following

Strongly disagree (1) Disagree (2) Somewhat disagree (3) Neither agree nor disagree (4) Somewhat agree (5) Agree (6) Strongly agree (7)

Its use would be positive for my life (1)

Its use would be beneficial to my family (2)

Its use would be beneficial to society (3)

HCP Support MoPPS Scale

Q14 Please rate the following statements- Thinking about the health care professional you saw most recently in relation to motherhood e.g. (midwife or health visitor)

Strongly disagree (1) Disagree (2) Somewhat disagree (3) Neither agree nor disagree (4) Somewhat agree (5) Agree (6) Strongly agree (7)

They were sensitive (1)

They were understanding (2)

They gave me enough information (3)

They were supportive (4)

They had plenty of time (5)

They gave good information about the parenting role (6)

They gave good information about the needs of the baby (7)

Social support MSPSS Scale

Q15 Thinking about the people closest to you, please rate the following statements

Strongly disagree (1) Disagree (2) Somewhat disagree (3) Neither agree nor disagree (4) Somewhat agree (5) Agree (6) Strongly agree (7)

There is a special person who is around when I am in need (1)

There is a special person with whom I can share my joys and sorrows. (2)

My family really tries to help me. (3)

I get the emotional help and support I need from my family. (4)

I have a special person who is a real source of comfort to me (5)

My friends really try to help me (6)

I can count on my friends when things go wrong (7)

I can talk about my problems with my family (8)

I have friends with whom I can share my joys and sorrows (9)

There is a special person in my life who cares about my feelings (10)

My family is willing to help me make decisions (11)

I can talk about my problems with my friends (12)

Q18 Finally, please share any thoughts on how you feel about the idea of the motherhood App as described in the scenario and screen shots

_____

Q17 We would like to collect some demographic information, please answer the following questions

_____

Q18 What is your age?

o 18-25 (1)

o 26-34 (2)

o 35+ (3)

Q19 Are you a first or second time mother?

o First time (1)

o Second time (+) (2)

Q20 What is the age of your youngest child?

o 0-6months (1)

o 6-12 months (2)

o 12-18 months (3)

o 18-24 months (4)

Q17 Thank you for completing the survey. Please read the following debrief form outlining the aims and purpose of the study.

PARTICIPANT DEBRIEF

Name of Researcher: Emma Kemp

Name of Supervisor: Dr Liz Sillence

Project Title: Examining new mother's perspectives of technology use for storing and sharing information

What was the purpose of the project?

The purpose of this project was to determine if intention to use a new App could be predicted using the Technology Acceptance Model. Predictors of use included Perceived Usefulness, Perceived Ease of Use, Trust, Privacy concerns, Social Support, Health Professional support and attitudes. This was the final study of a PhD

project which looked at ways in which new mothers used digital information sources to record their experiences of motherhood along with postnatal recovery symptoms and mental health. As per previous work we expect to find that participants who perceive the App easy to use and a useful tool will positively predict the intention to use it. If privacy and trust concerns are low, then this will positively predict intention to use the App. Participants who are less satisfied with social or heath professional support will also be more likely to use the App.

How will I find out about the results?

Once the study is complete and data has been analysed (currently August 2022) approximately 12 weeks after this date you are welcome to contact the researcher for a summary of the results if you are interested.

If I change my mind and wish to withdraw the information I have provided, how do I do this?

If you wish to withdraw your data then email the investigator named in the information sheet within 1 month of taking part and given them the code number that was allocated to you (this can be found on your debrief sheet). After this time it might not be possible to withdraw your data as it could already have been analysed.

The data collected in this study may also be published in scientific journals or presented at conferences. Information and data gathered during this research study will only be available to the research team identified in the information sheet. Should the research be presented or published in any form, all data will be anonymous (i.e. your personal information or data will not be identifiable). All information and data gathered during this research will be stored in line with the Data Protection Act and will be destroyed 36 months following the conclusion of the study. If the research is published in a scientific journal it may be kept for longer before being destroyed. During that time the data may be used by members of the research team only for purposes appropriate to the research question, but at no point will your personal information or data be revealed. Insurance companies and employers will not be given any individual's personal information, nor any data provided by them, and nor will we allow access to the police, security services, social services, relatives or lawyers, unless forced to do so by the courts. If you wish to receive feedback about the findings of this research study then please contact the researcher at emma.j.kemp@northumbria.ac.uk This study and its protocol have received full ethical approval from Faculty of Health and Life Science Research Ethics Committee. If you require confirmation of this, or if you have any concerns or worries concerning this research, or if you wish to register a complaint, please contact the Chair of this Committee David Smailes stating the title of the research project and the name of the researcher:

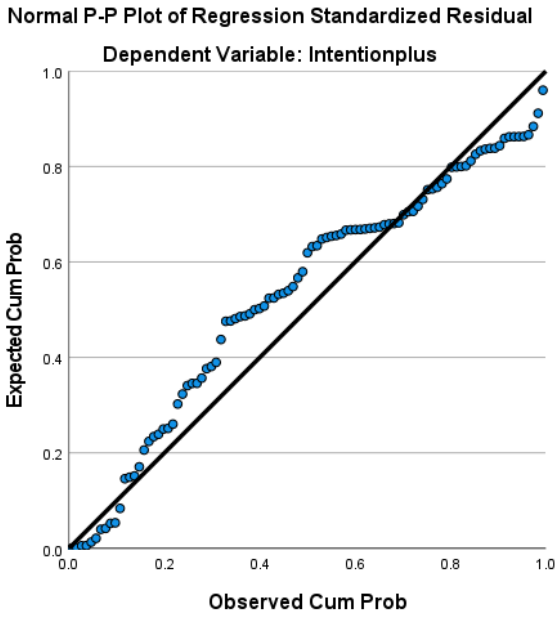
Appendix 14. Study 5: SPSS main data outputs

Descriptive Statistics

Descriptive Statistics

	Mean	Std. Deviation	N
Intentionplus	60.0909	13.03456	99
Privacy	13.45	5.242	99
Easeofuse	19.35	2.326	99
HCPSupport	31.56	7.600	99
SocialSupport	66.55	8.561	99

P-PLOT



ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4839.669	4	1209.917	9.630	.000[b]
	Residual	11810.513	94	125.644		

Total	16650.182	98			

a. Dependent Variable: Intentionplus

b. Predictors: (Constant), SocialSupport, Privacy, HCPSupport, Easeofuse

Model Summary table

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.539[a]	.291	.260	11.20909	1.891

a. Predictors: (Constant), SocialSupport, Privacy, HCPSupport, Easeofuse

b. Dependent Variable: Intentionplus

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	12.600	13.279		.949	.345		
	Privacy	-.531	.224	-.213	-2.372	.020	.932	1.073
	Easeofuse	2.455	.505	.438	4.858	.000	.927	1.078
	HCPSupport	.035	.154	.021	.228	.820	.935	1.070
	SocialSupport	.090	.138	.059	.654	.515	.919	1.089

a. Dependent Variable: Intentionplus

Study 5: ANOVA TABLES

Descriptive statistics for ANOVA 1(MUM age)

Descriptives

Intentionplus

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
18-24	6	68.3333	12.33964	5.03764	55.3837	81.2830	50.00	82.00
25-34	67	60.8507	11.75411	1.43599	57.9837	63.7178	15.00	82.00
35+	25	58.2000	12.91962	2.58392	52.8670	63.5330	21.00	75.00
Total	98	60.6327	12.18110	1.23048	58.1905	63.0748	15.00	82.00

ANOVA

Intentionplus

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	506.935	2	253.467	1.734	.182
Within Groups	13885.841	95	146.167		
Total	14392.776	97			

ANOVA 2 (First/Second time mum)

Descriptive statistics

Descriptives

Intentionplus

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
FIRST	53	62.2453	12.12738	1.66582	58.9026	65.5880	15.00	82.00
SECOND	45	58.7333	12.10259	1.80415	55.0973	62.3694	21.00	82.00
Total	98	60.6327	12.18110	1.23048	58.1905	63.0748	15.00	82.00

ANOVA

ANOVA

Intentionplus

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	300.164	1	300.164	2.045	.156
Within Groups	14092.611	96	146.798		
Total	14392.776	97			

ANOVA 3 (Child age)

Descriptive statistics

Descriptives

Intentionplus

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
0-6MONTHS	20	62.8000	13.42660	3.00228	56.5162	69.0838	29.00	82.00
6-12MONTHS	19	59.5789	8.53305	1.95761	55.4662	63.6917	39.00	72.00
12-18MONTHS	31	60.1290	12.91444	2.31950	55.3920	64.8661	21.00	82.00
18-24MONTHS	28	60.3571	12.95066	2.44744	55.3354	65.3789	15.00	80.00
Total	98	60.6327	12.18110	1.23048	58.1905	63.0748	15.00	82.00

ANOVA

ANOVA

Intentionplus

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	300.164	1	300.164	2.045	.156

Within Groups	14092.611	96	146.798		
Total	14392.776	97			

Cronbachs alpha

Perceived ease of use

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.818	.853	4

Perceived usefulness

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.907	.907	4

Behavioural intention

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.936	.936	3

Privacy concerns

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.942	.942	4

Trust

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.808	.815	3

Attitudes

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.864	.867	3

Healthcare professionals

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.934	.941	7

Social support

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.896	.903	12

Exploratory factor analysis

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.764
Bartlett's Test of Sphericity	Approx. Chi-Square	2828.452
	df	465
	Sig.	.000

Total variance explained.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.859	22.127	22.127	6.466	20.857	20.857
2	4.793	15.462	37.590	4.462	14.395	35.252
3	4.482	14.459	52.048	4.217	13.603	48.856
4	2.939	9.482	61.530	2.680	8.645	57.500
5	2.503	8.075	69.605	2.201	7.101	64.602
6	2.051	6.615	76.220			
7	1.427	4.602	80.822			
8	.738	2.380	83.202			
9	.714	2.303	85.505			
10	.490	1.582	87.087			
11	.422	1.362	88.449			
12	.401	1.295	89.744			
13	.344	1.109	90.853			
14	.308	.994	91.847			
15	.283	.913	92.760			
16	.268	.863	93.624			
17	.248	.799	94.422			
18	.218	.704	95.126			
19	.187	.604	95.730			
20	.173	.559	96.290			
21	.159	.513	96.803			
22	.151	.488	97.291			
23	.135	.436	97.727			
24	.129	.415	98.142			
25	.120	.388	98.530			

26	.105	.339	98.870			
27	.095	.307	99.176			
28	.080	.259	99.435			
29	.071	.230	99.665			
30	.060	.193	99.858			
31	.044	.142	100.000			

Extraction Method: Principal Axis Factoring.

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