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How optimal caseload midwifery can modify predictors for preterm birth in young women: integrated findings from a mixed methods study

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Introduction

This paper reports on a mixed methods research project examining younger women's experiences of, and outcomes associated with, caseload midwifery compared to standard care. Caseload midwifery describes a model of maternity care that focusses on providing the woman with 'continuity of carer' from a known midwife throughout pregnancy, labour/birth and the postpartum period (Sandall et al., 2016). Key quantitative findings from our cohort study, which included a reduction in preterm birth for women receiving caseload midwifery care compared to women attending standard care (Allen et al., 2015a); are integrated with results from our focussed, ethnographic study on the caseload model (Allen et al., 2015b). The aim of

the integrative analysis was to articulate possible mechanisms by which caseload midwifery may reduce preterm birth (PTB) for young women.

Preterm birth

The World Health Organisation defines PTB as any birth prior to 37 completed weeks of gestation (1977). The Australian definition adds that PTB must be either >20 completed weeks of gestation or >400 grams birth weight (Australian Institute of Health and Welfare, 2015). Despite these definitions, figures on global incidence of PTB focus on the number of liveborn preterm babies because of the significant health care costs associated with neonatal intensive care and lifelong disability (Blencowe et al., 2012). Over the past 20 years, the global incidence of PTB has been increasing to approximately 11.1% of all livebirths in 2010; ranging from 5% in some northern European countries to over 15% in sub-Saharan Africa (Blencowe et al., 2012). Preterm birth occurs in 5% to 7% of all live births in high-resource countries (Lawn et al., 2006); with higher rates in the United States (US) (12.4%) compared to the United Kingdom (7.4%) (MacDorman & Mathews, 2010). Preterm birth rates in high-resource countries increase in vulnerable populations e.g. women <20 years of age (10%) and Australian Indigenous women (14%) compared to mothers aged 20-39 and non-Indigenous women (both 8%) (Australian Institute of Health and Welfare, 2015); with rates as high as 21% in some remote Australian Indigenous communities (Kildea et al., 2016).

Preterm birth is the leading cause of newborn death, the second cause of under-five mortality (after pneumonia), and is associated with serious morbidity and lifetime disability (Howson et al., 2012). Short-term complications include respiratory

distress, poor feeding and/or hypoglycaemia in the newborn, frequently leading to neonatal intensive care unit (NICU) admission (Celik et al., 2013). The resultant separation between young mothers and their babies has negative implications for maternal well-being (Lasiuk et al., 2013) and breastfeeding (M. Parker et al., 2013). Admission to NICU due to PTB is associated with significantly increased direct health care costs (Clements et al., 2007).

The causes of spontaneous PTB are complex, multifactorial and often unknown but can include genetic, environmental, behavioural and socio-economic factors (Goldenberg et al., 2008). Socioeconomic deprivation is an independent predictor for preterm birth (Koullali et al., 2016; Ncube et al., 2016). In high-resource countries like Australia, Canada, Europe, New Zealand (NZ), the United Kingdom (UK) and the United States (US); adolescents who become pregnant and continue the pregnancy are more likely to come from socio-economically disadvantaged backgrounds (Harden et al., 2009; Imamura et al., 2007; Pradhan et al., 2015). The effect of social deprivation on behaviour, health and living conditions are strongly associated with both adolescent pregnancy and PTB; the risk factors are identical (see Table 1).

Modifying the risk and protective factors inherent in adolescents daily lives, especially for those who are most socio-economically disadvantaged, can improve health outcomes (Viner et al., 2012). Indeed, programmes targeted to improve the circumstances of socially disadvantaged women can reduce PTB (Fernandez Turienzo et al., 2016; Hollowell et al., 2011). While there is some evidence that single interventions including smoking cessation, improved diet for under-nourished women, and antenatal lower genital tract screening are effective in reducing PTB

rates (Piso et al., 2014); the effect of model of care is a PTB research priority (Duley et al., 2014). A Cochrane systematic review of participants enrolled in different models of maternity care (n=17,674) found that women randomised to midwife-led care, compared to standard care, were less likely to give birth preterm (Sandall et al., 2016). Our cohort study (Allen et al., 2015a) was the first to find similar results for young women (aged 21 years or less).

The gap in the literature this paper addresses, focusses on how the complex intervention of caseload midwifery functions in relation to preterm birth. We sought to identify: “what are the active ingredients within the intervention and how are they exerting their effect? Only by addressing this kind of question can we build a cumulative understanding of causal mechanisms” (Medical Research Council, 2006, p. 7). To understand and answer this question required critical analysis of the various elements of the intervention, the literature that exists to support the intervention, and this resulted in the development of a model that best explains our findings.

Methods

Methodology

Pragmatism is commonly adopted as the methodology of choice for mixed methods research (Johnson et al., 2007; Teddlie & Tashakkori, 2012). Critical pragmatism is an approach for researchers who wish to take account of, and transform, existing social relations and power structures (Vannini, 2008). Critical pragmatism was adopted as the theoretical framework for this project. This meant that the research

was primarily motivated to find pragmatic solutions to the problems identified in the literature that were, first and foremost, in the best interests of young women.

Research Design

A mixed method triangulation design (convergence model) (Creswell, 2012), allowed quantitative and qualitative data to be collected concurrently; and analysed independently. The quantitative and qualitative findings were granted equal, but different, significance within the project. Detailed descriptions of methods and findings for the quantitative and qualitative components are published elsewhere (Allen et al., 2015a; Allen et al., 2015b); however a brief description is provided below to contextualise this paper.

Research Setting

In one Australian tertiary referral hospital, young women (aged 21 years or less at booking) accounted for approximately 10% (n=500) of births each year. A young women's caseload midwifery model started in 2008 and ran parallel to the existing Young Women's Clinic (YWC); which was an antenatal-only team midwife program. Both models were located in a community venue and incorporated birth and parenting preparation classes as part of antenatal care. Caseload midwifery provided each woman with a primary midwife, 24-hour telephone contact with her midwife or back-up, a booking visit in her home, community-based antenatal care that occurred in a group with other young pregnant women, a familiar midwife in labour (one of the four midwives in the group), and postnatal home visiting for 4-6 weeks after birth. The caseload model at the study site was atypical because of the inclusion of group antenatal care (GAC).

Caseload midwifery was the only model to demonstrate clinically significant benefits for young women when compared to standard care (Allen et al., 2015a); and the only model that was subjected to qualitative enquiry. Therefore, while quantitative outcomes must include reporting for both caseload midwifery and YWC compared to standard care; caseload midwifery is the primary focus of this paper.

Data Collection

Our cohort study (n=1908) measured perinatal outcomes for young women aged 21 years or less, with a singleton pregnancy without fetal anomaly, who gave birth in the research setting (Allen et al., 2015a). Participants were either allocated (at booking visit), or subsequently transferred and received (at admission for labour/birth) one of three possible models of care: caseload midwifery, YWC or standard care (Allen et al., 2015a). Analysis was by both intention-to-treat and treatment-received, and controlled for identified confounding variables (Allen et al., 2015a). Young women allocated to caseload care at booking, compared to standard care, were less likely to have a preterm birth (adjusted odds ratio 0.59 (0.38–0.90, $p = 0.014$)) or a NICU admission (adjusted odds ratio 0.42 (0.22–0.82, $p = 0.010$)) (Allen et al., 2015a). There were significant differences on secondary outcomes, which will be integrated with the qualitative findings in this paper.

Our focused ethnographic study was conducted in the same setting as the cohort study (Allen et al., 2015b). Data included observation and field notes, interviews with caseload midwives (n=4) and young women (n=10), and key documents; data were coded by two researchers independently (Allen et al., 2015b). The critical approach

had several significant implications for data analysis. First, it meant that the voices of the women were privileged over all other data sources. Second, participants' words were not simply taken at 'face value'; instead they were analysed and interpreted through a critical lens. Third, the researchers' thoughts and feelings were recorded through field notes, as these data were considered a valid source of information that was used to inform the analysis (Altheide & Schneider, 2013). Critical analysis of these data generated three themes: 1) women's first group encounters, 2) the woman–midwife interaction, and 3) women's limited opportunities to 'get to know (each other)' (Allen et al., 2015b).

Data Analysis

The results of the quantitative and qualitative analyses were compared and contrasted in order to answer the research question: *how does caseload midwifery affect preterm birth rates for young women?* Integration enabled the results of the cohort study to be contextualised, validated and understood in more depth than would otherwise have been possible (Collins et al., 2006). The integration process involved highlighting and comparing findings from both the cohort and ethnographic studies. Concepts were generated when there was interaction between key quantitative and qualitative results either around the same topic, or in such a way that the qualitative findings could assist with explaining the quantitative outcomes. Integration was conducted using a 'weaving' narrative approach whereby both quantitative and qualitative findings were woven together on a concept-by-concept basis (Fetters et al., 2014). Relevant theoretical and/or research literature was retrieved and woven into the integrated findings in order to contextualise and justify

them. This led to the development of an empirical model to answer the research question.

This research project was granted approval by the Hospital (1553M) and University (Q2011-69) Human Research Ethics Committees.

Findings and Discussion

This section combines presentation of the integrated findings with discussion of their significance. Key quantitative and qualitative findings were integrated under two minor themes: 1) turning up and 2) buying in. The major theme, Synergistic Health Engagement, was identified as the overarching concept which integrated the findings. Quotes included from the qualitative results are reported in *“italics”*, whereas words that have been added are placed inside [square brackets] and words that have been deleted are indicated by [...].

Minor Theme 1: Turning Up

This theme weaves together results concerning choice of model of care, earlier maternity booking and more frequent antenatal visits.

Choice of model of care

Young women were directly allocated to caseload midwifery until it reached capacity, after which they were allocated to YWC or standard care (Allen et al., 2013). None of the young participants in the focus groups recalled any discussion about choice of care provider (doctor or midwife) or a preference for model of care (Allen et al., 2015b). The caseload midwives believed that the process of direct allocation to the

model was defensible because young women, particularly those with psycho-social risk factors, were (arguably) getting a better service than they would otherwise, for example if they had been allocated to standard care e.g. GP shared care (Allen et al., 2015b).

Women who are socially disadvantaged are commonly offered fewer choices and feel less able to exercise control in maternity care settings (S. Parker et al., 2014). Yet by 12 years of age most adolescents demonstrate decision-making 'competence', including the ability to understand options, make choices and compromises, and appreciate consequences (Hein et al., 2015). In a parallel study, assessing the feasibility of recruiting adolescents to a randomised controlled trial of caseload midwifery; 87.5% (n=7) of eligible adolescents declined randomisation because they wanted to choose their model of care (Allen et al., 2013). We suggest that having the option to make informed decisions about care provider and model of care sets the scene for young women continuing to engage in health care throughout their childbearing experience, and possibly beyond.

Earlier maternity booking

Gestation at booking, proportion of women who have a booking visit in the first trimester, or 'late' booking, are commonly measured as proxies for (in)adequate antenatal care (Bollini & Quack-Lotscher, 2013). Some NZ and UK studies have used the definition of 19 weeks gestation or later to define 'late' booking (Baker & Rajasingam, 2012; Corbett et al., 2014). In our cohort study, young women who received caseload midwifery, compared to standard care, had their first booking visit at an earlier median gestation {IQR} (Caseload: 15 weeks {6}, YWC: 18 weeks {8},

Standard: 19 weeks {11}, $p < 0.001$) (Allen et al., 2015a). In other words, young women in caseload care were typically seen at the beginning of the second trimester, compared to women in standard care who were seen an average of four weeks later. Early booking for maternity care presents an opportunity for timely identification and management of risk factors for preterm birth.

Research suggests that some women delay booking maternity care because of ambivalence or fear; while system failures (e.g. lost referrals) also result in delayed booking (Haddrill et al., 2014). In this setting, caseload midwives were ideally placed to address younger women's fears and prevent them 'falling through the gaps' in the hospital administrative system. The first contact was initiated by the caseload midwife who made a telephone call to introduce herself to the young woman, describe the service, and arrange a home booking visit (Allen et al., 2015b). It is possible that this personal contact, compared to simply receiving an official appointment letter in the post, facilitated earlier booking visits. Furthermore, the caseload midwives had flexibility to schedule their booking visits at a time and a place that was suitable to both themselves and their clients (Allen et al., 2015b). However, whether offering a home visit to conduct the 'booking-in' visit facilitated earlier commencement of antenatal care, warrants further research.

More frequent antenatal visits

Antenatal care is generally thought to improve pregnancy outcomes including preterm birth (Fernandez Turienzo et al., 2016; Hollowell et al., 2011). Receiving less than five visits, compared to five or more visits, has been associated with an eight-fold increase in preterm birth, after adjusting for known confounders (Raatikainen et

al., 2007). In our cohort study, we excluded participants who had less than two antenatal visits. Young women in caseload care had lower rates of inadequate antenatal attendance (2-4 visits) compared to standard care (Caseload: 7%, YWC: 8%, Standard: 12%, $p=0.002$) (Allen et al., 2015a). The setting for the antenatal visits and how maternity care was provided may have affected young women's willingness to attend.

In the research setting, young women receiving caseload care accessed a community venue. Participants appreciated getting everything (clinical care and childbirth education) in one place at one time through the GAC sessions (Allen et al., 2015b). Generally women prefer an informal, relaxed, aesthetically-pleasing (Novick, 2009; Sword et al., 2012), welcoming environment that "does not feel clinical" (Sword et al., 2012, p. 6). Participants described their preference for accessing pregnancy care in a "homely" community setting rather than in a hospital around "sick people" (Allen et al., 2015b). Most young women liked having their check-up take place on a yoga mat on the floor, rather than an examination table, because it felt "less medical" (Allen et al., 2015b). Informal environments appear to afford protection against the shame adolescents can feel when sitting in a waiting room with older pregnant women (Arthur, 2007; James et al., 2012). Venues where they can just 'hang-out' and talk with their peers are valued by this age group (Arthur, 2007). For marginalised women, factors that promote continuing antenatal attendance include a non-threatening environment, non-judgemental, trustworthy and culturally sensitive staff, and a service that is perceived as providing quality care (Downe et al., 2009).

Minor Theme 2: Buying In

This theme comprised a number of sub-themes including: disclosure, self-care, and accepting help in relation to modifiable risk factors for preterm birth.

Disclosure

The first antenatal booking visit is the recommended time for routine screening to be conducted with respect to previous and current mental health status, domestic violence, smoking and illicit drug use (Australian Health Ministers' Advisory Council, 2012; Bollini & Quack-Lotscher, 2013).

Young women in caseload care reported similar rates of smoking, but higher rates of illicit drug use than those in standard care (Caseload: 33%, YWC: 37%, Standard: 24%, $p < 0.001$). Marijuana is the most commonly used illicit drug in Australia (Australian Institute of Health and Welfare, 2011); use during pregnancy is a risk factor for preterm birth (Gunn et al., 2016). In our study, it was unclear whether differences in the rates of illicit drug use reflected difference in incidence or in willingness to disclose drug use to their midwife. Disclosure at booking is significant as it allows early intervention using harm minimisation strategies; which are effective for reducing drug use among adolescents (Vogl et al., 2014).

Young women in caseload care reported higher rates of a previously diagnosed mental illness than those in standard care (Caseload: 24%, YWC: 24%, Standard: 16%, $p < 0.001$); for example depression, anxiety, schizophrenia, bi-polar and eating disorders (Allen et al., 2015a). There were considerable missing data for the Edinburgh Postnatal Depression Score which is routinely collected to screen for current symptoms of anxiety or depression. However, personal history of mental

illness is a strong predictor of antenatal anxiety and depression (Biaggi et al., 2016) and high levels of psychological distress after 30 weeks of pregnancy is associated with adverse outcomes including PTB (Liou et al., 2016). Therefore disclosure at the first visit is crucial to implement effective strategies and referral pathways to support mental well-being (Morrell et al., 2016).

Disclosure is associated with how comfortable the woman feels with the care provider, including whether rapport has been built (Phillips & Thomas, 2015). Caseload midwifery increases women's perceptions of feelings safe enough to confide in the midwife (Beake et al., 2013). The midwife's level of sensitivity, receptiveness and interpersonal skills which affect the willingness of pregnant women to disclose mental illness at their first booking appointment (Phillips & Thomas, 2015). It is thus possible that the differences we observed in rates of mental illness and illicit drug use reflected differences in participants' willingness to self-report during their first appointment. In caseload care, the first booking visit is typically provided in the woman's home or chosen venue; conducted by the primary midwife who will be responsible for the woman's care throughout pregnancy, birth and postpartum. One participant reported the home visit enabled her to develop "*rapport*" with her midwife (Allen et al., 2015b). The potential for an on-going interaction, and the development of a midwife-woman 'partnership' (Guilliland & Pairman, 2010), may increase young women's willingness to disclose difficult life circumstances and experiences (Stanley et al., 2006); although this was not described by focus group participants.

Self-care

Feeling involved and in control of one's health and well-being is strongly linked to healthy behaviours in young adults (less than 25 years) (Hargreaves et al., 2014). Therefore ensuring young women feel at the centre and in control of their pregnancy care, may facilitate increased self-care behaviours.

Social support acts as a buffer against stress by assisting women to develop coping strategies; in this way it reduces PTB (Straub et al., 2014). Pregnant adolescents are particularly vulnerable to stressful events including worries about money, (un)employment, and (in)secure accommodation; interventions that strengthen social support may reduce the negative impact of these and other stressors and improve emotional and physical wellbeing (Divney et al., 2012). Both midwives and the young women interviewed in our study (Allen et al., 2015b), recalled using text messaging and telephone contact as a way to talk about additional issues that they did not feel comfortable raising in the group setting. The young women reported that they found it *"reassuring"* to communicate with a midwife with whom they were familiar (Allen et al., 2015b). Ann explained that she felt comfortable to phone her midwife outside of scheduled sessions because: *"she didn't make me feel stupid; she made me feel better about (what was going on)"* (Allen et al., 2015b). One of the caseload midwives stated that women often phoned on the pretence of a clinical issue as a strategy for seeking emotional support (Allen et al., 2015b). In this way caseload midwifery offered an additional mechanism for social support, which is protective against PTB.

Women value talking with other pregnant women in groups to give, and receive, support and normalise their experiences of pregnancy (Novick, 2009). Pregnant

adolescents specifically want to meet others their own age (Price & Mitchell, 2004). In our study (Allen et al., 2015b), participants described that although they didn't get to know each other very well, they found simply being around other young pregnant women in group antenatal sessions both enjoyable and reassuring. Peer support may lessen both maternal anxiety (as measured by the stress hormone cortisol) and antenatal depression (Field et al., 2013). Therefore, by promoting emotional support and reassurance which mitigates against stress, peer support could be protective against PTB.

There is strong evidence that certain nutritional interventions during pregnancy improve neonatal outcomes (Zulfiqar et al., 2013). A systematic review of energy and protein intake in pregnancy reported that nutritional advice was associated with an increase in maternal protein intake and fewer preterm births (Ota et al., 2012). Midwives need to be mindful that pregnant adolescents food intake is compounded by social factors including poverty, living away from home, not having cooking knowledge or equipment, and being vulnerable to body image issues and eating disorders (Stapleton, 2010). Continuity of carer enables midwives to provide individualised care and advice unique to the woman's life circumstances (Beake et al., 2013). A trusting relationship between the midwife and the young woman may increase the likelihood that advice will be followed (Stapleton, 2010).

Accepting help

Women in caseload care and YWC had higher rates of being offered and accepting referral to social workers (Caseload: 51%, YWC: 48%, Standard Care 31%, $p < 0.001$) and psychologists (Caseload: 8%, YWC: 4%, Standard Care: 2%, $p < 0.001$) at the

first booking visit compared to women in standard care (Allen et al., 2015a). It is possible that the way in which information about mental health services was presented, where and by whom, influenced acceptance of referral during pregnancy. While this was not discussed directly by focus group participants, an observational study of women with complex social factors reported that women who received caseload midwifery were more likely to be referred to support services for mental health and domestic violence (Rayment-Jones et al., 2015).

Major Theme: Synergistic Health Engagement

Integrated analysis of the quantitative and qualitative findings from this project suggested a mechanism by which Optimal Caseload Midwifery may facilitate young women “turning up” for antenatal care (at an earlier gestation and more frequently) and “buying in” to the process by disclosing risks, engaging in self-care activities and accepting referrals for assistance. We hypothesise that is the mechanism by which caseload midwifery can modify predictors for preterm birth with this population of childbearing women (see Figure 1).

Optimal Caseload Midwifery

We have defined Optimal Caseload Midwifery to include a specific philosophical approach, personal attributes and institutional infrastructure (see Figure 1). How these three components are optimised has been defined with reference to the key elements of the model delivered in the research setting and the research literature.

Optimal philosophical commitments include belief in normalcy of birth, woman-centred care, and commitment to health promotion (Kennedy, 2000). Key attributes

of a 'good midwife' include being knowledgeable, skilful, a good communicator, supportive, and able to 'be there' for women (Nicholls & Webb, 2006). Childbearing women want to be offered support and choice that enables them to feel in control (Borrelli, 2014). The midwife-woman partnership (Guilliland & Pairman, 2010) has been internationally accepted as the platform through which midwifery care is optimally delivered. Further, the professional friendship that can develop within a caseload midwifery model enables the woman to feel safe and midwives to provide empathetic care and act as an advocate for the woman (Walsh & Devane, 2012). In the context of pregnant adolescents, caseload midwifery has the potential to facilitate trusting relationships that can empower young women to feel involved and take responsibility for their pregnancy (Boyle et al., 2016).

The institutional infrastructure and managerial support for caseload midwifery should value and prioritise the philosophical commitments and personal attributes required to optimise the model. Furthermore the infrastructure including 24-hour access to primary midwife, community-based and home visits, and back-up provisions should be organised to optimise the midwife-woman relationship in order to promote the young woman's engagement with maternity care.

Synergistic Health Engagement

Health engagement has been described as "actions individuals must take to obtain the greatest benefits from the health care services available to them" (Gruman et al., 2010, p. 350). Engagement of 'patients' or 'adolescents/youth' with health care services or interventions is commonly reported in the research literature; and often

measured simply in terms of initiation, attendance and retention (Pullmann et al., 2013).

In the context of maternity care, health engagement is routinely measured and reported as the woman simply 'turning up' for care e.g. gestation at first visit, total number of antenatal visits etc. We suggest that in order to achieve the greatest benefits, young women need to do more than just 'turn up' to their maternity appointments; they also need to 'buy-in' to their health care. The term 'engagement' may be more broadly interpreted to encompass "the feeling of being involved in a particular activity" (MacMillan Dictionary, 2014). Participants 'buy-in' when they make "emotional investment and commitment to [care because they believe] that it is worthwhile and beneficial" (Staudt et al., 2012, p. 185).

Targeting health inequalities by developing partnerships between clients and health providers, using a framework of empowerment, has been recommended by the UK Commission on Social Determinants of Health (Marmot et al., 2008). When both the midwife and the young woman act in accordance with a shared goal, maternity care is likely to be more effective than if either acted in isolation. We have termed this Synergistic Health Engagement as it requires both people (midwife and young woman) to act in the young woman's best interests.

Strengths

The mixed method triangulation design (convergence model) enabled the research question and objectives to be considered through the most appropriate quantitative and qualitative methods and enabled a greater understanding of the results. Our

cohort paper (Allen et al., 2015a) is currently the largest study of caseload midwifery for young women (n=1971). Prior to this study, the evidence for caseload midwifery provided to young women was weak (Allen et al., 2012). Our qualitative paper is the first published study to explore the combination of caseload midwifery and group antenatal care (Allen et al., 2015b). The integration of qualitative data strengthened the findings by exploring and providing a theoretical mechanism for the efficacy of caseload midwifery for an urban population of young pregnant women.

Limitations

There were several limitations including the use of retrospective cohort data, the inclusion of non-adolescent young participants (aged 20-21 years), and the potential confounding of GAC on the caseload midwifery model.

Retrospective data

The retrospective quantitative data used in this study had two major limitations. Firstly, the secondary outcomes reported in this paper were not controlled for confounding differences between young women in the caseload midwifery and standard care groups. These differences, for example socio-economic status, may be associated with the difference in antenatal care attendance rather than model of care. Secondly, the use of retrospective data limited the number of data items that were available. As the integration of findings progressed it became clear that some quantitative data that would have been useful either had high levels of missing data (e.g. Edinburgh Depression Score at booking) or were not collected (e.g. smoking status and weight at 36 weeks gestation).

Participants

There is a strong body of literature correlating adverse perinatal outcomes, including preterm birth, and pregnancy in adolescence (aged 19 years or less). This research setting included women up to 21 years of age; therefore participants who were not strictly adolescents were included in the cohort study. Young women who are 20-21 years may not have the same risks associated with childbearing; therefore their inclusion could be considered confounding.

Model of care

Two models of care, caseload midwifery and GAC, were amalgamated at the research site. This made it difficult to unpick which elements of this complex intervention affected outcomes; and whether it was caseload midwifery or GAC that was effective; or indeed the combination of both elements. The qualitative study (Allen et al., 2015b), called for further research into this complex intervention.

Recommendations

Risk factors for preterm birth that are potentially modifiable in the antenatal period, could be addressed by a caseload midwifery model that incorporates evidence-based interventions to support and facilitate 1) earlier maternity booking and adequate antenatal attendance; 2) the development of greater emotional resilience; 3) ideal gestational weight gain; 4) no/minimal smoking and illicit drug use; 5) a reduction in genito-urinary infections. A complex intervention could then be tested in comparison to standard care using a prospective research design. Measuring adolescents' health engagement in the context of maternity care would be useful, and could be achieved by adapting and piloting the adolescent health engagement

survey which includes items relating to the experience of health care, health access and health self-efficacy (Sebastian et al., 2014). In-depth interviewing combined with observations of young women's consultations with caseload midwives might help to elucidate whether there is a connection between the establishment of a trusting relationship with a midwife and disclosure of risk factors/acceptance of help and support.

Conclusion

Optimal Caseload Midwifery (which includes midwives with specific personal attributes and philosophical commitments, along with appropriate institutional infrastructure and support) facilitates midwives and young clients to develop trusting relationships and engage in maternity care. Health engagement can modify predictors for preterm birth that are common amongst pregnant adolescents by promoting earlier maternity booking, sufficient antenatal care, greater emotional resilience, ideal gestational weight gain, less smoking/drug use, and fewer untreated genito-urinary infections.

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Figure 1 Empirical Model: Synergistic Health Engagement

Table 1. Risk factors for adolescent pregnancy and preterm birth

Adolescent Pregnancy	Preterm Birth
<ul style="list-style-type: none"> • <i>Cigarette smoking</i> (Bottorff et al., 2014) 	<ul style="list-style-type: none"> • <i>Cigarette smoking</i> (Koullali et al., 2016)
<ul style="list-style-type: none"> • <i>Alcohol, cannabis and other illicit drug use</i> (Salas-Wright et al., 2015) 	<ul style="list-style-type: none"> • <i>Exposure to environmental tobacco</i> (Ashford et al., 2010; Crane et al., 2011; Savitz & Murnane, 2010) • <i>Cannabis use</i> (Prunet et al., 2016)
<ul style="list-style-type: none"> • <i>Sub-optimal nutrition</i> (Bloomfield, 2011) 	<ul style="list-style-type: none"> • <i>Low/high body mass index</i> (Koullali et al., 2016)
<ul style="list-style-type: none"> • <i>Inappropriate gestational weight gain</i> (Haggarty et al., 2009; Harper et al., 2011) 	<ul style="list-style-type: none"> • <i>Inappropriate gestational weight gain</i> (El Rafei et al., 2016)
<ul style="list-style-type: none"> • <i>Maternal anxiety and/or depression</i> (Siegel & Brandon, 2014) 	<ul style="list-style-type: none"> • <i>Maternal anxiety</i> (Liou et al., 2016) • <i>Maternal depression</i> (Accortt et al., 2014) • <i>Stress</i> (Straub et al., 2014)
<ul style="list-style-type: none"> • <i>Intimate partner violence</i> (Edirne et al., 2010; O'Donnell et al., 2009) 	<ul style="list-style-type: none"> • <i>Intimate partner violence</i> (Donovan et al., 2016)
<ul style="list-style-type: none"> • <i>'Inadequate' antenatal care</i> (Debiec et al., 2010; Raatikainen et al., 2007) 	<ul style="list-style-type: none"> • <i>'Inadequate' antenatal care</i> (Prunet et al., 2016)
<ul style="list-style-type: none"> • <i>Genito-urinary infection</i> (Goyal et al., 2016) 	<ul style="list-style-type: none"> • <i>Genito-urinary infection</i> (Sangkomkamhang et al., 2008)

Highlights

- The mechanism by which caseload midwifery reduces preterm birth is unclear
- Results of this mixed methods study suggests 'optimal' caseload midwifery promotes young women to engage in maternity care
- 'Synergistic' health engagement involves 'turning up' and 'buying in'
- 'Synergistic' health engagement can modify predictors for preterm birth in young women

