



Literature support for Cradle Cincinnati Infant Mortality Indicators
Hamilton County, Ohio
November 2013

PRECONCEPTION HEALTH

1. Unintended Pregnancy

- Gipson, J.D., Koenig, M.A., & Hindin, M.J. (2008). The effects of unintended pregnancy on infant, child, and parental health: A review of the literature. *Studies in Family Planning*, 39 (1): 18-38.

The existing evidence on the impact of unintended pregnancy on child and parental health outcomes is mixed and is limited by an insufficient number of studies for some outcomes and by the aforementioned measurement and analytical concerns. Differences in the measurement and classification of pregnancy intention further complicate the comparison of studies. Among the studies that incorporated both mistimed and unwanted pregnancies /births, the impact of pregnancy intention on health consequences was inconsistent, with some studies finding unwanted pregnancies particularly disadvantaged and others finding significant negative effects only for mistimed pregnancies. These inconsistencies point to the need for improved understanding and measurement of pregnancy intention across study settings. In addition, the broader acknowledgment and incorporation of the degrees of "unintendedness" into analytic models would better represent the heterogeneity of this concept and the severity of associated health outcomes.

Despite a considerable number of studies (often conducted in the United States) on some outcomes, evidence for other outcomes is limited or nonexistent. That so few studies are available from developing country settings is particularly striking, considering that the financial, social, and physical costs of unintended pregnancy are likely to be greater in resource-poor settings. The scarcity of studies on this topic is surprising, given that the prevention of unintended pregnancy has been a major rationale for the funding and provision of family planning, both in the United States and internationally.

The evidence of the impact of unintended pregnancy on abortion-related morbidity and mortality points to the need for primary and secondary prevention efforts. Primary prevention, through the increased provision and use of effective contraceptive methods, can reduce levels of unintended pregnancy. In the event of an unintended pregnancy, secondary prevention efforts can help to ensure safe abortion and post abortion services to prevent ongoing illness and death for the estimated 46 million women around the world who have abortions each year.

Among studies that have assessed antenatal care, breastfeeding behavior, and child nutrition, the evidence is relatively consistent, showing a negative effect of unintended pregnancy. The developed

country studies found more pronounced effects on the timing, rather than the frequency, of antenatal care and found persistent negative effects on the breastfeeding of children who resulted from unintended pregnancies. For developing countries, the evidence of these outcomes is more limited, yet what evidence there is suggests that the effects of pregnancy intention on antenatal care may be even more severe than it is in developed countries, and that unintended pregnancy also may affect negatively the breastfeeding and nutritional status of children who resulted from unwanted pregnancies.

For other outcomes, such as maternal risk behaviors, pregnancy outcomes, and curative care, developed country studies failed to find a significant association with pregnancy intention; the paucity of studies from developing countries precludes an overall assessment of such an impact. The few existing studies suggest that the children who result from unintended pregnancies may, in fact, be disadvantaged with respect to low birth weight and incomplete vaccinations; additional investigation is needed to substantiate or contradict these findings.

Although studies conducted in developed countries are limited, findings from rigorous developing country studies suggest that children who are the result of unintended pregnancies are at an increased risk of infant mortality, compared with children resulting from intended pregnancies. Consistent evidence shows higher levels of mortality and malnutrition for female children as a result of son preference. Differentiation of the effects of being unintended versus the effect of the child's sex could help to broaden the understanding of differential treatment and underinvestment in children, particularly within developing country settings.

The scarcity of studies on the effects of unintended pregnancy on the physical and mental health of men and women also must be noted. Beyond maternal and abortion-related mortality, relatively few studies have assessed the effects of unintended pregnancy on women's health and well-being. The studies that have been conducted indicate a positive association between unintended pregnancy and depression, anxiety, and abuse. Several of these studies are cross-sectional, however, and do not include baseline measures of psychosocial wellbeing. An additional concern is the absence of studies designed to assess the potential consequences to fathers of unintended pregnancies. Because the role of fathers is that of principal or sole wage earner in many contexts throughout the world, the pressure to provide adequately for a family increases with the number of children in the household. Research is needed to assess whether unintended pregnancy results in adverse physical and mental health outcomes for both men and women.

Although they are not reviewed here, a few studies have attempted to measure the long-term social and health impacts on older children, adolescents, and adults that result from unintended pregnancies. The potential long-term and cumulative consequences of unwantedness necessitate longitudinal study designs and a focus on health outcomes beyond the early childhood years. Findings of the impact of pregnancy intention into late adolescence and early adulthood suggest that future work in this area is warranted.

In their design and analysis, future studies should incorporate strategies to isolate and to estimate accurately the independent effects of being "unintended" on children's health outcomes. Longitudinal

cohort studies provide an opportunity to assess such temporal associations and could provide a means of assessing the cumulative effects of unintended pregnancy. The use of hierarchical models or matched sibling analyses could allow for the comparison of both wanted and unwanted siblings, thereby controlling for both observable and unobservable family-level characteristics.

Although this literature review identifies specific gaps in existing knowledge of the effects of unintended pregnancy, the most recent studies also indicate a shift toward more rigorous methodologies and research designs. Future research in this area must continue to evolve by overcoming methodological limitations and by embracing a broader view of the potential impacts of unintended pregnancy for children and their families.

2. Major Life Stressors

- Cardwell, M.S. (2013). Stress: Pregnancy considerations. *Obstetric and Gynecological Survey*, 68 (2): 119-129.

Stress-induced pregnancy complications - preterm labor, pregnancy-induced hypertension, low-birth weight babies, and neuropsychological developmental delays of children - are responsible for a significant portion of overall perinatal morbidity and mortality. Although the field of psychology has long recognized the importance of stress in the etiology of psychological and medical disorders, the medical field has only recently accepted this importance. The reason for this delayed acceptance was the reliance of the medical profession on the biomedical model of health and disease rather than the more parsimonious biopsychosocial model of health and disease.

The biopsychosocial model explains very aptly the role of stress in the production of stress-induced complications of pregnancy. Psychosocial factors such as socioeconomic status, work status, marital status, level of education, access to prenatal care, substance abuse, ethnicity, cultural background, and quality of relationships with partners and parents act upon biological/physiological mechanisms to produce stress induced pregnancy complications. The biological mediators are primarily the stress hormones cortisol and cytokines and the neurotransmitter, norepinephrine. These mediators are released, respectively, by activation of the hypothalamic-pituitary-adrenal axis and the autonomic nervous system. These stress mediators are responsible for the peripheral responses that result in the stress-induced complications such as vasoreactivity, contraction of uterine musculature, and the resetting of the hypothalamic-pituitary axis. The primary health care provider may actively intervene to prevent stress-induced pregnancy complications in many women. The first step is to identify women at risk for stress-induced complications. A screening instrument for psychosocial risk factors during pregnancy has been recommended by the ACOG. This instrument is a questionnaire that is easy to administer and takes only 1 to 2 minutes. Serial screening is recommended throughout pregnancy and the postpartum period. Pregnant women with positive screens should be closely monitored, and interventions should be used as necessary. Most pregnant women with positive screens may be managed by the primary health care provider; however, it may be necessary to refer some women, especially those with preexisting mental disorders, to a competent mental health care provider.

The evaluation and management of stress-induced pregnancy complications represent an opportunity for health care providers to make a great difference in the lives of many: the mother-to-be, the child, family members, and society in general. Health care providers should beware of the role of stress in the genesis of diseases, even those outside the realm of pregnancy. General adoption of the biopsychosocial model by the medical field would do much to further these goals.

3. Social and Emotional Support

- (See Indicators 2, 16)
 - Oakley, A. (1985). Social support in pregnancy: The “soft” way to increase birthweight? *Social Science & Medicine*, 21 (11): 1259-1268.

This paper has surveyed three categories of studies relevant to the notion that birth weight as an outcome of human pregnancy is capable of being influenced by supportive social relationships. Many of the available studies suffer from methodological problems that reduce the confidence attachable to their findings. But there is considerable evidence to suggest that intervention programs aimed at improving the ‘social’ side of antenatal care form an appropriate research and policy strategy for the future. The target of these programs, low birth weight, is in Britain and other countries a major contributing factor to the pool of perinatal mortality and short- and long-term morbidity in infants and families. It also constitutes a growing element in the economic costs of the maternity services, and in the costs of the personal social services providing long-term help for individuals with handicaps of perinatal origin.

Childbearing is a process bridging the domains of the social and biological. For this reason, it is probably the most convincing evidence of the inability of the modern medico-scientific paradigm satisfactorily to ‘explain’ the behavior of bodies in a social world. Traditionally, epidemiology and medical sociology have all tended to limit childbearing to a category of its own. Instead of seeing childbearing as an exemplar of the general rules applying to social influences on, and implications of, health and illness states, these disciplines have set it aside in a world of its own. Social support networks have been shown to be important in many fields including the health of the elderly, psychiatric illness, and mortality generally. Existing data on the social support disorder relation suggest that the relationship between the two is remarkably nonspecific, but as Berkman has observed, one of the greatest needs in future research is to refine the social support measures used.

The terms in which the debate about perinatal mortality, LBW and social inequality have been conducted to date have not encouraged admission of the evidence surveyed in this paper relating to social support. There are now signs of an international initiative among epidemiologists and social scientists properly to test the effects (or otherwise) of social interventions on pregnancy outcome. Out of the literature reviewed in this paper a number of suggestions can be made about the desirable parameters of these new research initiatives.

These are that:

- (1) The first tasks of researchers should be adequately to test the main hypothesis that additional social support provided to pregnant women is capable of affecting birth weight (and other pregnancy outcomes).
- (2) Any research that is carried out in this field should carefully document and define what is meant by ‘social support’.
- (3) Research interventions should aim to separate out the various components of previously tried intervention packages (e.g. health education, dietary counseling, continuity of care in the antenatal

clinic, psychotherapeutic interviewing etc.), so that the effect of each component may be tested separately.

(4) There is reason to suppose the impact of social interventions on birth weight and other pregnancy outcomes may be different. For example there may be no effect on birth weight, but the rate of infant hospital admissions may be lower, the incidence of parental confidence in parenting may be higher and the incidence of postpartum depression lower.

(5) It is important to hypothesize a differential effect of social support on different subgroups of women, for example women at high risk of having a LBW infant vs those at low risk, and women with high baseline levels of social support vs those with low levels.

(6) The possibility should be borne in mind that an intervention designed to be socially supportive may be negatively experienced by some women and therefore associated with decreased rather than increased birth weight.

(7) The model of the dietary studies may well apply to social interventions and social support generally. Women at risk of producing infants within a certain birth weight group may be more responsive to social interventions than others, as may those carrying male rather than female babies. A critical difference may well exist between women experiencing LBW delivery for intrinsic 'biological' reasons, these women being more likely to 'repeat' LBW in a subsequent pregnancy, and those doing so because of some particular environmental onslaught, who are not so likely to have LBW babies in subsequent pregnancies. If this is the case, not only will the intervention be likely to benefit 'nonrepeater' mothers more, but it may be less important from a policy point of view for 'repeater' mothers, whose babies have been shown to have better overall survival chances.

- Ickovics, J.R., Kershaw, T.S., Westdahl, C., Magriples, U., Massey, Z., Reynolds, H., & Schindler, S. (2007). Group prenatal care and perinatal outcomes: A randomized controlled trial. *Obstetrics & Gynecology* 110 (2): 330-339.

Group prenatal care has been implemented in over 100 clinical practices in the United States and abroad since 1995. It provides an integrated approach to prenatal care in a group setting, incorporating family members, peer support, and education. In prior studies of group prenatal care among minority teens and women, investigators documented lower rates of preterm birth and low birth weight. However, these studies were limited by lack of randomization and potential self-selection bias.

A multisite randomized controlled trial was conducted at two university-affiliated hospital prenatal clinics. Pregnant women aged 14–25 years (n =1,047) were randomly assigned to either standard or group care. Women with medical conditions requiring individualized care were excluded from randomization. Group participants received care in a group setting with women having the same expected delivery month. Timing and content of visits followed obstetric guidelines from week 18 through delivery. Each 2-hour prenatal care session included physical assessment, education and skills building, and support through facilitated group discussion. Structured interviews were conducted at study entry, during the third trimester, and postpartum.

Mean age of participants was 20.4 years; 80% were African American. Using intent-to-treat analyses, women assigned to group care were significantly less likely to have preterm births compared with those

in standard care: 9.8% compared with 13.8%, with no differences in age, parity, education, or income between study conditions. This is equivalent to a risk reduction of 33% (odds ratio 0.67, 95% confidence interval 0.44–0.99, $P<.045$), or 40 per 1,000 births. Effects were strengthened for African-American women: 10.0% compared with 15.8% (odds ratio 0.59, 95% confidence interval 0.38–0.92, $P<.02$). Women in group sessions were less likely to have suboptimal prenatal care ($P<.01$), had significantly better prenatal knowledge ($P<.001$), felt more ready for labor and delivery ($P<.001$), and had greater satisfaction with care ($P<.001$). Breastfeeding initiation was higher in group care: 66.5% compared with 54.6%, $P<.001$. There were no differences in birth weight nor in costs associated with prenatal care or delivery.

4. **STD rates (syphilis, gonorrhea, chlamydia)**

- CDC STD and Pregnancy Fact Sheet: <http://www.cdc.gov/std/pregnancy/STDFact-Pregnancy.htm>

STDs can complicate pregnancy and may have serious effects on both a woman and her developing baby. Some of these problems may be seen at birth; others may not be discovered until months or years later. In addition, it is well known that infection with an STD can make it easier for a person to get infected with HIV. Most of these problems can be prevented if the mother receives regular medical care during pregnancy. This includes tests for STDs starting early in pregnancy and repeated close to delivery, as needed.

Syphilis is primarily a sexually transmitted disease, but may be passed to a baby by an infected mother during pregnancy. Passing syphilis to a developing baby can lead to serious health problems. Syphilis has been linked to *premature births*, *stillbirths* and, in some cases, death shortly after birth. Untreated infants that survive tend to develop problems in multiple organs, including the brain, eyes, ears, heart, skin, teeth, and bones. Screening for syphilis should be performed in all pregnant women during their first prenatal medical visit and repeated in the third trimester, if the patient is considered to be at high risk.

- Richardson, K.K. & Shannon, M.T. (2012). STI screening and treatment in pregnancy. *The Nurse Practitioner*, 37 (12): 30-37.

Reported cases of primary and secondary syphilis in U.S. females older than 10 years of age increased by 38% between 2004 and 2007. In 2008, the primary and secondary syphilis rate for women increased to 1.5 cases per 100,000 population, followed by a 21.4% decline (1.1 cases per 100,000) in 2010. The rate of congenital syphilis (CS) increased 18% between 2006 and 2008. In 2009 and 2010, the number of cases decreased; however, the rate of (CS) was 8.7 cases per 100,000 live births. A diagnosis of CS is viewed as a failure of prevention and screening in the prenatal care system; it represents a missed opportunity to identify and treat syphilis in the mother. Although the overall incidence of CS is small, it represents a high cost for the care of infected infants.

The majority of CS cases between 2005 and 2010 occurred in the Southern United States. Almost one-third of CS cases identified in 2008 occurred in infants whose mothers had not received prenatal care. Routine screening of all pregnant women during the first antepartum visit with repeat prenatal testing is indicated in women with risk factors (such as new sexual partners or clinical manifestations of syphilis) and during the intrapartum period.

The CDC has tracked cases of gonorrhea in the United States since 1941, and data indicates that the seroprevalence rates for gonorrhea are highest in the southern United States. From 1975 to 1996, the CDC observed a 74% decline in gonorrhea followed by a 10-year plateau in reported cases. Between 2006 and 2010, there has been a 15.8% overall decrease in cases reported. However, there was a 2.8% increase in the rates reported since 2009. In 2010, 309,341 gonorrhea cases were reported in the United States. Slightly higher rates of infection are reported in women compared to men, with young women between 15 and 24 years having the highest reported incidence. In addition, Black women are 17 times more likely to become infected with gonorrhea compared to White women. Similar disproportionately higher rates of infection have been observed in Black men compared to White men. Similar to CT infection, gonorrhea infection is asymptomatic in a majority of women; however, it is a major cause of PID that can result in fallopian tube damage leading to infertility, ectopic pregnancy, and chronic pelvic pain.⁵ Although the number of gonorrhea cases in the United States has steadily declined, it is estimated that 13,200 pregnant women become infected each year, and if not recognized and treated, they are at a twofold increased risk for preterm birth. In addition, they can transmit gonorrhea to their infants during childbirth. Neonatal gonococcal infection has been associated with ophthalmia neonatorum, pharyngitis, rectal infections, and, rarely, pneumonia. Because of the prevalence of gonorrhea in young women, the fact that it is usually asymptomatic, and the adverse perinatal consequences associated with untreated gonorrhea in pregnant women, the CDC and the U.S. Preventive Services Task Force recommend that all pregnant women at risk for gonorrhea infection or who live in areas with a high prevalence of gonorrhea be screened during the first prenatal visit. Repeat testing during the third trimester is recommended for women who were diagnosed with gonorrhea during the first trimester and uninfected women who are at high risk for exposure (that is, women with a new partner, multiple sexual partners, and/or a history of inconsistent condom use).

Chlamydia trachomatis (CT) infection is one of the most common STIs in women of reproductive age with rates for chlamydia (610.6 cases/100,000 women) five times higher than rates reported for gonorrhea (106.5 cases/100,000 women). It is associated with significant morbidities including pelvic inflammatory disease (PID), ectopic pregnancy, and infertility. In 2010, the CDC received reports of 949,802 cases of CT infection in women, reflecting a 1% increase in cases compared to 2009. During the same period, CT infection in women was observed to be approximately three times that of men, which has been attributed, in part, to higher rates of CT screening in women compared with men. Surveillance of prenatal clinics in several U.S. states revealed positive chlamydia tests in 7.7% of pregnant women (range 2.7% to 21.2%). Annually, an estimated 100,000 pregnant women will experience a CT infection. Higher rates of CT infections are observed in women who are socioeconomically disadvantaged racial/ethnic minorities between ages 15 and 25 years. CT infection during pregnancy has been associated with a twofold increased risk of having a low birth weight infant.³ It is estimated that 50% to 70% of infants born to infected, untreated mothers will also become infected and experience adverse sequelae, including inclusion conjunctivitis and pneumonia.⁹ Since 80% to 90% of infected women are asymptomatic, it has been recommended that sexually active women younger than 25 years undergo routine annual CT screening. All pregnant women should undergo CT screening during the first prenatal visit; repeat testing should be performed during the third trimester for women younger than 25 years, women at risk for CT exposure and infection (from new sexual partner(s)), or those diagnosed with and treated for CT infection during their first trimester.

5. **Substance Abuse Rates (Tobacco, Alcohol, Illegal Drugs)**

- Society of Obstetrician and Gynecologists of Canada. (2011). Clinical Practice Guidelines: Substance Use in Pregnancy. *International Journal of Gynecology and Obstetrics*, 114: 190-202.

Substance use during pregnancy is common. In national prevalence surveys, 14% of Canadian women reported using alcohol during their last pregnancy, and 17% reported smoking during pregnancy. The prevalence of illicit drug use among Canadian women of childbearing age is less but not insignificant. In United States population surveys ~5% of pregnant women reported illicit drug use during the preceding month. Marijuana remains the most commonly used illegal drug, followed by cocaine. Women report higher rates than men of prescription drug use, including pain relievers (23.1%), opioid analgesics (2.1%), sleeping pills (1.7%), tranquilizers (1.1%), and antidepressants (2.1%).

The use of alcohol and drugs by pregnant women can result in significant maternal, fetal, and neonatal morbidity. In general, pregnant women with substance use disorders are less likely to seek prenatal care, and they have higher rates of infectious diseases such as HIV, hepatitis, and other sexually transmitted infections.

There are numerous direct and indirect costs of perinatal substance exposure. In 2002, the overall social cost of substance abuse in Canada, including burden on health care, law enforcement, and loss of productivity due to premature death and ill health, totaled ~\$40 billion. Data from American studies have indicated that the increase in cost of neonatal care for infants born to mothers who smoke cigarettes is ~\$700, and the increase in cost for those exposed to cocaine is \$5,110 per patient.

Because of the prevalence of substance use and its clinical and economic impact, health care providers need to know how to identify and care for the affected patient population. Management of substance use disorders is complicated because of the associated comorbid conditions and psychosocial and socioeconomic factors, such as mental health problems, poor housing, financial stressors, and lack of supports. Canadian physicians have identified a lack of knowledge and training regarding the effects of and treatments for substance use during pregnancy as another barrier to providing care for these patients. Perinatal care providers have several opportunities during pregnancy to identify and assist women who have substance use problems. Although most physicians enquire routinely about alcohol, tobacco, and other drug use during pregnancy, many do not use a specific screening tool and are not making referrals to other treatment resources. As motivation to change unhealthy or harmful behaviors is increased during pregnancy, it is an ideal time to intervene with women who have substance use problems.

6. Pre-pregnancy Body Mass Index

- Fretts, R.C. (2005). Etiology and prevention of stillbirth. *American Journal of Obstetrics & Gynecology*, 193, 1923-1935.

The prevalence of maternal obesity is increasing steadily and is associated with an increased risk of fetal macrosomia and perinatal mortality. The reasons for this association are speculated to be due to behavioral, socioeconomic, as well as obstetric factors. Obese women are more likely to smoke and to have pregnancies complicated by gestational diabetes and preeclampsia. However, even when controlling for these factors, an elevated BMI remains a significant risk factor for stillbirth, and the association appears to increase as the gestation advances. A number of mechanisms for the increased risk seen in obese women have been postulated. Thinner women may be better able to perceive decreased fetal movements. Maternal obesity is also associated with hyperlipidemia, which may contribute to increased endothelial dysfunction, platelet aggregation, as well as to clinically significant atherosclerosis. Sleep studies of pregnant women have shown that obese women spend more time

snoring (32% vs 1%; $P < .001$), have more apnea-hypoxia events (1.7 vs 0.2/h; $P < .05$), and have more episodes of oxygen desaturation (5.3 vs 0.3/h; $P < .005$) than non-obese pregnant women. Snoring has also been associated with pregnancy-induced hypertension and fetal growth restriction. Indeed, in addition to advanced maternal age and low socioeconomic status, as discussed previously, the most prevalent risk factor for stillbirth is pre-pregnancy obesity.

- Flenady, V., Koopmans, L., Middleton, P., Froen, J.F., Smith, G.C., Gibbons, K., Coory, M., Gordon, A., Ellwood, D., McIntyre, HD., Fretts, R., & Ezzati, M. (2011). Major risk factors for stillbirth in high-income countries: A systematic review and meta-analysis. *The Lancet*, 377, 1331-1340.

Meta-analysis revealed that maternal weight, maternal smoking, maternal age, primiparity, small size for gestational age, placental abruption, and pre-existing maternal diabetes or hypertension were the most important and potentially modifiable risk factors from the literature review.

Combined maternal overweight (BMI 25–30 kg/m²) and obesity (BMI >30 kg/m²) before pregnancy was the top ranking modifiable risk factor for stillbirth in the study countries. Meta-analysis of five studies that assessed overweight, and four studies that assessed obesity, revealed associated increases in the odds of stillbirth of 23% and 60%, respectively. Three studies reported on BMI higher than 40 kg/m², which was associated with an increase of two times in the odds of stillbirth (OR 2.08 [95% CI 1.58–2.73]).

The combined prevalence of overweight and obesity ranged from 28% to 58% across the five study countries, and yielded PARs of around 8–18%. The total number of stillbirths per year associated with this risk factor was 16,822. No association between stillbirth and low maternal weight was shown in two studies that reported on BMI lower than 25 kg/m².

A large, well designed, Swedish study by Villamor and Cnattingius reported that the risk of stillbirth increased linearly with weight gain between pregnancies, which supports a causal relation. Women who gained 3 kg/m² or more between the first and second pregnancy, irrespective of whether they were overweight during the first pregnancy, led to a 60% increase in the odds of stillbirth (OR 1.63 [95% CI 1.20–2.21]). The effect was stronger for term than for preterm births, which suggests a relation between BMI and placental function.

7. Stable Housing

- Vinikoor-Imler, L.C., Messer, L.C., Evenson, K.R., & Laraia, B.A. (2011). Neighborhood conditions are associated with maternal health behaviors and pregnancy outcomes. *Social Science and Medicine*, 73: 1302-1311.

The analysis created five neighborhood constructs (physical incivilities, social spaces, walkability, arterial features and borders) at the block group level using directly observed street level data. The neighborhood indices were associated with pregnancy-related behaviors among both NH white and NH black women and with pregnancy-related outcomes among NH white women. This supports previous research using U.S. census data showing that neighborhood environment is not only related to birth outcomes but is also associated with maternal health behaviors that are on the pathway to birth outcomes.

The physical incivilities index had the greatest internal reliability and percent variance explained. It was also the index most consistently associated with maternal health behaviors. For both NH whites and NH blacks, greater physical incivilities were associated with higher odds of smoking and inadequate weight gain. In addition, among NH white women, higher amounts of physical incivilities were associated with excessive weight gain. Our findings are consistent with other published work. A previous study in Sweden showed that smoking during pregnancy was more prevalent in poor neighborhoods and that smoking likely modified the association between neighborhood socioeconomic status and birth weight. The physical incivilities index was correlated with neighborhood deprivation, and residents of neighborhoods characterized by high physical incivility and high poverty may have less access to supermarkets or stores with healthy food products. This could result in less healthy food options and women may not consume enough for adequate weight gain. Conversely, it is possible that women who have less access to healthy food may consume even healthier foods while pregnant, resulting in excessive weight gain. Finally, women dealing with stress and other psychosocial factors have been observed to consume more food during pregnancy. Future studies of stress resulting from neighborhood deprivation will provide a more in-depth understanding of these relationships.

Higher physical incivilities were associated with all three birth outcomes for NH white women. No associations were detected among NH black women. Previous studies have shown that neighborhood disorganization is inversely associated with birth weight and perception of neighborhood security is inversely associated with small-for gestational age infants.

Approximately 38% of the women included in the analyses were NH black, and more NH black women delivered at younger ages. A greater percentage of the NH white women had more than a high school education, reported being married, and were primiparous, compared to the NH black women. The smoking prevalence was generally low among women of both races. Comparable proportions of both NH white and black women gained more than 40 pounds during pregnancy and experienced PIH. NH black women delivered almost three times as many term low birth weight term infants and almost twice as many preterm infants, compared to their NH white counterparts.

A considerably larger proportion of NH white women resided in block groups with low amounts of physical incivilities; by contrast far more NH black women lived in block groups with the highest level of observed physical incivilities. NH white and NH black women were comparably distributed across the quartiles of social spaces. While more NH white women resided in more walkable block groups, compared to less walkable block groups, NH black women were about equally distributed across walkable block groups. Most NH white and NH black women lived in block groups with moderate amounts of borders, but more NH black women lived in block groups with the most arterial features compared to NH white women. Associations with pregnancy-related behaviors and outcomes among NH white women

In unadjusted models for NH white women, maternal residence in block groups characterized by greater physical incivilities was associated with higher odds of adverse pregnancy related behaviors and outcomes. High levels of physical incivilities were associated with maternal smoking and inadequate and excessive weight gain. High levels of physical incivilities were also associated with all three pregnancy-related outcomes. Residence in block groups with high amounts of social spaces was also associated with higher odds of maternal smoking and inadequate weight gain, but only residence in block groups with the highest levels of social spaces were associated with excessive weight gain and preterm birth. In block groups with greater walkability, the odds of adverse pregnancy behaviors were lower, as were the

odds for preterm birth and PIH. Higher levels of arterial features were associated with lower odds of smoking and inadequate weight gain. Block groups with more arterial features were not associated with any pregnancy outcomes. The amount of borders present was not associated with any maternal behavior or outcome.

Following adjustment for maternal covariates, the patterns of association between block group indices and pregnancy-related behaviors and outcomes remain fairly consistent for NH white women, but the point estimates were uniformly attenuated. Residence in block groups with high amounts of physical incivility was associated with greater odds of maternal smoking, inadequate or excessive weight gain, and PIH. Only exposure to the highest quartile of physical incivilities was associated with greater odds of term low birth weight and preterm birth. Higher quartiles of social spaces were associated with greater odds of smoking and inadequate gestational weight gain, but not with pregnancy outcomes. Higher walkability continued to be associated with lower odds of maternal smoking, inappropriate weight gain, and PIH; importantly, walkable neighborhood also remained associated with an approximately 20% lower odds of preterm birth. There was still no association between borders and pregnancy-related behaviors and outcomes. Moderate to high levels of arterial features remained associated with reduced odds of maternal smoking.

- Stein, J.A., Lu, M.C., & Gelberg, L. (2000). Severity of homelessness and adverse birth outcomes. *Health Psychology, 19* (6): 524-534.

This study reports birth outcomes by ethnicity and overall. For ease of interpretation, normative statistics by ethnicity are also included. Only singleton births were used for comparison because no multiple births were reported in this sample. The results supported the hypothesis that the outcomes among the homeless women would be considerably more adverse than national averages. Almost 17% of the sample reported babies that weighed less than 2,500 g at birth as opposed to the national average of 6%. The average weight in grams for the babies was at the low end of the normal range: 3,113.3 g. The women also reported preterm births more frequently than national averages: 19% of the women in our sample reported a birth before 37 weeks, whereas the national average is 10%.

Birth outcomes were worse for homeless women of color. The African American homeless women reported the most low-birth weight babies, as defined as babies weighing less than 2,500 g (22%). They also reported average weights below the normal range (3,022.9 g). Over 15% of the Hispanic women reported babies of low birth weight. In contrast, the non-Hispanic White women in the homeless sample reported about the same number of low-birth weight babies as is found among non-Hispanic White women in the general population (5.4% vs. a national average of 5.0%).

Similarly, both the African American women and the Hispanic women reported more preterm births than national averages (21% vs. 18% and 14% vs. 11%, respectively). The women in the "others" category (primarily Native American) also reported a large number of preterm births and lower-than-average-birth weight babies, but the size of the sample was too small to draw solid conclusions about this outcome. However, national norms available for Native American women indicate that the homeless Native Americans reported considerably worse outcomes than national averages. The White women reported fewer preteen births than national averages (7.8% vs. 9.6% in the general population).

The racial-ethnic disparity in birth outcomes was greater within the homeless population studied here than within the general population. African American women reported the most adverse

outcomes. Homeless African American women were four times more likely to deliver a low-birth-weight baby and nearly three times more likely to deliver a premature baby as homeless White women. In the general population, African American women are less than twice as likely to deliver a low-birth-weight or premature baby as White women. Multiway frequency analyses indicated that the African American homeless women reported significantly more low-birth-weight babies than the White and Hispanic homeless women, $p < .05$. An analysis of variance (ANOVA) with the continuous outcomes (in grams) produced similar results. Differences in preteen births among White, African American, and Hispanic women were not significant for either the dichotomous or the continuous outcomes. However, when minority women were combined into one group, the difference in preterm births between the White women and the minority women was significant, $p < .05$, for the dichotomous variable. Similar results were obtained in an ANOVA with the continuous outcome of the gestation period measured in weeks, $p < .05$.

- Culhane, J.F. & Goldenberg, R.L. (2011). Racial disparities in preterm birth. *Seminars in Perinatology*, 35: 234-239.

The notion that health is, in part, determined by factors above and beyond individual behavior or use of medical care services is not a new concept, nor is the concern over high infant mortality. In 1925, the Children's Bureau commissioned a study to explore factors associated with infant mortality. The report concluded, "the fathers of 88% of the babies (infant deaths) included in the Bureau's studies earned less than \$1250 a year . . . As the (family) income doubled the mortality rate was more than halved. Which is the more safe and sane conclusion? That 88% of all these fathers were incorrigibly indolent or below normal mentally, or that sound public economy demands irreducible minimum living standards. . . ." This comment suggests that the researchers did not attribute all the risk for infant mortality to individual attributes but rather to the living conditions associated with low income.

Interestingly, the concept that social conditions figure prominently in shaping health virtually disappeared by 1950 when public health became dominated by a single-minded focus on individualism, conceptual, methodological, and political. As a result, health status was considered a direct reflection of health behaviors and use of medical care services. Public health interventions have largely focused on identifying people at risk (eg, undereducated, smokers, substance abusers, sedentary, overweight) and providing educational interventions aimed at altering the behavioral culprit. With regard to the racial/ethnic disparity in PTB, the emphasis on individual risk factors has not proven fruitful. The discussions below on race-specific associations between education, prenatal care use and smoking with risk of PTB will demonstrate that single-minded foci on these risk factors will not eliminate the race/ethnic disparity in PTB.

An education gradient exists within each race/ethnic group such that women with more education demonstrate a lower rate of PTB. However, non-Hispanic black women with 13 or more years of education have significantly greater rates of PTB when compared with non-Hispanic white women with < 12 years of education. When the infant mortality rate for infants born to two-college educated parents was assessed, non-Hispanic black infants had 2 times the rate of infant mortality compared with non-Hispanic whites and this difference was almost completely attributable to differences in the rate of PTB. Education differentials alone cannot explain the race/ethnic disparity in PTB.

With regard to prenatal care, very little advantage in PTB rate reduction exists for women entering care in the first trimester compared with those entering care in the third trimester. With this said, non-

Hispanic black women entering care in the first trimester have significantly increased rates of PTB compared with non-Hispanic white women entering care in the third trimester. As with education, focusing on getting all women into care within the first trimester of pregnancy will do little to reduce the race/ethnic disparities in PTB.

Finally, a health behavior that is consistently associated with increased risk of PTB is smoking. Women who smoke have about 1.5 times the risk of PTB compared with nonsmokers. Interestingly, non-Hispanic black women have significantly lower rates of antenatal smoking compared with non-Hispanic white women. The 3 examples presented provide evidence that addressing individual attributes have not, and likely will not, lead to reductions in the race/ethnic disparity of PTB.

In the tradition of public health from the early 1900s, the public health community has recently called for a “new public health” focusing on the upstream social conditions that pattern and condition health status independent of, or in interaction with, individual characteristics. As a result, the research community has turned attention to reexamining the role that social context or “neighborhood” has on the production of risk and the race/ethnic disparity.

The association between neighborhood disadvantage, race/ethnicity, and risk of adverse reproductive outcomes is complex. As a first step, it is easy to provide evidence that race/ethnic minorities generally have lower socioeconomic position compared with whites and reside in neighborhoods with more economic deprivation and social disorder and differential access to health enhancing resources. Culhane *et al* assessed the neighborhood characteristics for pregnant black and white women in Philadelphia. Although all women enrolled in this study were Medicaid recipients and thus socioeconomically disadvantaged at the individual level, the neighborhood characteristics were markedly different by race. Specifically, disadvantaged non-Hispanic white women lived in block groups with significantly lower rates of properties with 20% or more of their market value in tax arrears, lower rates of homelessness and fewer crimes against persons. Others have also shown that black women are more likely than white women to live in economically deprived neighborhoods with fewer medical and social services, poorer housing quality, and higher rates of crime and violence, factors that have been hypothesized to contribute to poor maternal health and adverse birth outcomes.

When the PTB rate of women residing in disadvantaged neighborhoods are compared with those living in more advantaged areas, without regard to maternal race/ethnicity, a consistent pattern of risk emerges. A small set of studies specifically examining the impact of neighborhood-level socioeconomic status on preterm birth rate found that, even after adjustment for behavioral and individual-level socioeconomic variables, neighborhood-level unemployment rate was significantly associated with an increased risk of preterm delivery. There is substantial evidence that non-Hispanic black women have more exposure to adverse neighborhood conditions compared with their non-Hispanic white counterparts and that adverse neighborhood conditions are associated with increased risk of PTB. The picture becomes more complex when maternal race is also considered. For example, O’Campo, and others evaluated the association between neighborhood-deprivation and risk of PTB for non-Hispanic white and non-Hispanic black women in stratified models in 8 metropolitan areas in the United States. Interestingly, neighborhood deprivation was more strongly associated with PTB for non-Hispanic white women compared with non-Hispanic black women.³⁰ Across the 8 metropolitan areas only 2 (odds ratio 1.23 and 1.26) of 8 regions demonstrated significant associations between neighborhood deprivation and risk of PTB in the non-Hispanic black models. For non-Hispanic white women, 7 of the 8 areas had significant odds ratios for neighborhood deprivation with values ranging from 1.48 to 2.24. Because the analytical strategy was to use race-specific models the contribution of neighborhood deprivation to the

racial disparity in PTB rates cannot be evaluated. In sum, non-Hispanic black women live in more disadvantaged neighborhoods and neighborhood disadvantage is associated with increased risk of PTB. What is not established is the contribution of this exposure to the racial/ethnic disparity in PTB. Further research in this area seems warranted.

8. Adequately Pregnancy Spacing (18+ months from delivery to conception)

- Conde-Agudelo, A., Rosas-Bermudez, A., & Kafury-Goeta, A.C. (2006). Birth spacing and risk of adverse outcomes: A meta-analysis. *JAMA*, 295: 1809-1823.

Using 3 different meta-analytical techniques, we show that birth to conception intervals shorter than 18 months and longer than 59 months are significantly associated with increased risk of several adverse perinatal outcomes, such as preterm birth, LBW, and SGA. Infants can have LBW either because they are born early (preterm birth) or are born SGA. Thus, the association between interpregnancy interval and LBW could be due to the independent effect of interval on both preterm birth and SGA. Less clear is the association between birth spacing and the risk of fetal and early neonatal death, although results from meta-regression curves suggest that interpregnancy intervals shorter than 6 months and longer than 50 months are associated with increased risk of these adverse perinatal outcomes. The strength of our inferences is based on compliance with stringent criteria for performing a rigorous systematic review. These included the use of a prospective protocol designed to address a research question; the methods used in the identification of relevant studies; no language restrictions; the exclusion of studies that did not adjust for at least maternal age and socioeconomic status; the strict assessment of methodological quality of included studies; the use of several techniques of meta-analysis (both unadjusted and adjusted analyses); the exploration of sources of heterogeneity; the quantitative summarization of the evidence; and the inclusion of a large number of women from different populations throughout the world.

The reasons for the association between a short interval between pregnancies and adverse perinatal outcomes are unclear. A plausible explanation is the maternal nutritional depletion hypothesis which states that a close succession of pregnancies and periods of lactation worsen the mother's nutritional status because there is not adequate time for the mother to recover from the physiological stresses of the preceding pregnancy before she is subjected to the stresses of the next. This results in depletion of maternal nutrient stores, with the subsequent increased risk of adverse perinatal outcomes. The folate depletion hypothesis claims that maternal serum and erythrocyte concentrations of folate decrease from the fifth month of pregnancy onward and remain low for a fairly long time after delivery. Women who become pregnant before folate restoration is complete have an increased risk of folate insufficiency at the time of conception and during pregnancy. As a consequence, their offspring have higher risks of neural tube defects, intrauterine growth restriction, preterm birth, and LBW. Some investigators have attributed the higher risk of poor pregnancy outcomes to several factors associated with having short intervals, such as socioeconomic status, unstable lifestyles, failure to use health care services or inadequate use of such services, unplanned pregnancies, and other behavioral or psychological determinants. However, the fact that the birth spacing effects are not strongly attenuated when socioeconomic and maternal characteristics are controlled for suggests that the effects are not caused by these confounding factors. Some hypotheses have also been proposed to explain the relationship between long intervals and adverse perinatal outcomes. Zhu et al have hypothesized that, after delivery; a woman's physiologic reproductive capacities gradually decline, becoming similar to those of primigravid women (ie, "the physiological regression hypothesis"). This hypothesis is supported by the observation that perinatal outcomes for infants conceived after an excessively long

interpregnancy interval are similar to outcomes of infants born to primigravid women. Another possibility is that unmeasured factors, such as sexually transmitted infections or maternal illnesses, may cause both adverse fertility and pregnancy outcomes. These factors could differ for women in developed and developing countries. Finally, residual confounding may still be an explanation for at least part of the reported associations.

Several potential limitations of our review must also be considered. First, like any systematic review, it is limited by the quality of original data. The great majority of studies calculated the interpregnancy interval using mother's recall of her previous child's date of birth and her last menstrual period, instead of birth dates recorded on the birth records and gestational age estimated from ultrasonography. In most studies the intervals were calculated as the time elapsed between 2 consecutive live births, ignoring induced or spontaneous abortions or fetal deaths between them, which can produce even longer intervals between live births. Nevertheless, this problem would not affect the findings for short intervals. In addition, several studies did not properly address the potential confounding effects of factors other than maternal age and socioeconomic status. Second, because there was considerable statistical heterogeneity in most of the meta-analyses performed, our findings should be interpreted with caution. Nevertheless, in the great majority of comparisons the estimates showed the same direction of effect, which could suggest the absence of clinical heterogeneity among the studies. Investigation of possible sources of heterogeneity provided no plausible explanations. In addition, it is possible that the I^2 heterogeneity test could have excessive power when there are studies with large sample size, as was the case with some of the ones included in our meta-analyses. Third, the number of studies available for analysis on the relationship between birth spacing and some adverse perinatal outcomes is still too small to provide conclusive evidence.

The effects of birth spacing on perinatal health found in our study, as well as the effects of both short and long intervals on infant, child, and maternal health, should furnish a strong motivating force for health personnel to provide family planning. The health sector should supply such care not only to those wishing to limit their fertility for personal, social, or economic reasons, but should also provide the needed services to those practicing family planning for health reasons. The results of our systematic review could be used by reproductive clinicians around the world to advise women on the benefits of delaying a subsequent pregnancy for approximately 2 to 5 years to improve the health of both mother and the next infant.

Despite the advances during the last 2 decades in understanding the relationship between birth spacing and adverse pregnancy outcomes, little information is available to explain the mechanisms by which birth spacing might improve the health of mothers and their children. Also, more studies are needed on whether the effects of birth spacing on perinatal health differ in developed vs developing nations. Finally, it is imperative to understand the causes for both short and long intervals in any population to interpret the data on health risks. The consequence of this may be that family planning policies and messages may need to be tailored to different populations.

9. Access to Primary Care

- Rowland Hogue, C.J. & Silver, R.M. (2011). Racial and ethnic disparities in United States: Stillbirth rates: Trends, risk factors, and research needs. *Seminars in Perinatology*, 35: 221-233.

Early access to prenatal care is an indicator of greater access to resources. In 2003, 24.1% of non-Hispanic black women but only 11.0% of non-Hispanic white women lacked first-trimester prenatal care.

Early prenatal care has been identified with lower stillbirth risk, but in one study this protective association was found only for non-Hispanic white women and not for non-Hispanic black women (after statistical control for other sociodemographic and medical factors). Whether improved access to prenatal care can reduce racial disparities in stillbirth risk remains to be determined.

- Fretts, R.C. (2005). Etiology and prevention of stillbirth. *American Journal of Obstetrics & Gynecology*, 193, 1923-1935.

Nationally, black women consistently have had approximately twice the risk of stillbirth of white women, although typically these rates are not adjusted for differences in obstetric and socioeconomic factors. In Massachusetts in 2002, for example, the household income for black families was significantly lower than that of white families, and black women are less likely to receive adequate prenatal care, less likely to have completed a high school education, and more likely to have received publicly funded prenatal care. Black mothers who have had a stillbirth were also less likely than white mothers to have sought obstetric care in the first 3 months of pregnancy.

Even when evaluating only women who had received adequate prenatal care, Vintzileos *et al* found that, in the United States, black women still had twice the risk of stillbirth when compared with white women. The excess of stillbirth was attributed to higher rates of diabetes, hypertension, placental abruption, and premature rupture of membranes. Given that black women are a relatively high-risk group for stillbirth, increasing access to prenatal care, and the identification and management of those medical and socioeconomic risk factors that contribute to stillbirth obviously will be important.

- Culhane, J.F. & Goldenberg, R.L. (2011). Racial disparities in preterm birth. *Seminars in Perinatology*, 35: 234-239.

Virtually all interventions aimed at reducing PTB, including those that target infection/inflammation, have been conducted during pregnancy. These include interventions to improve access to high-quality prenatal care, bed rest, nutrition counseling, caloric or vitamin/mineral supplementation, smoking, drug- or alcohol-cessation programs, and treatment for pelvic infections. The initiation of the interventions during pregnancy may explain why most of the interventions have failed to reduce PTB possibly because the underlying pathophysiology, such as inflammation/infection may have already been initiated and thus it was too late to interrupt the processes. Furthermore, it may take weeks or months after the behavioral risk factor is modified to see consequent improvements in pathophysiologic conditions leading to the PTB.

The strategy of intervening to lower risk for subsequent disease has been demonstrated in relation to cardiovascular disease, in which predisease markers have been targeted with some success. For these reasons altering the timing of interventions to either before the first pregnancy or between pregnancies may prove more successful. As an example, periodontal disease is a risk factor for PTB more common in black women. The trials aimed at treating periodontal disease during pregnancy have generally failed to reduce PTB. It is hypothesized that the treatment during pregnancy may be too late to reduce the inflammatory pathway leading to PTB already initiated and/or the treatment itself enhances the inflammatory state. Treatment of periodontal disease before pregnancy appears to be a more logical approach in women with this risk factor.

Thus, optimizing women’s health before gestation to reduce rates of preterm birth holds promise for reducing disparity. We know that non-Hispanic black women of childbearing age have significantly worse health profiles compared with their non-Hispanic white counterparts. For example, black women have greater rates of obesity, greater rates of type II diabetes, greater rates of high blood pressure, consume a greater fat diet, and as mentioned previously, have elevated rates of urogenital tract infections and periodontal disease. Although “treating” these adverse health conditions before pregnancy may help “even the reproductive playing field,” losing sight of what places minority women at risk of risk in the first place would seem irresponsible. In other words, reducing the approach to race/ethnic disparities in PTB to targeting only biomedical risk factors— even if done so before pregnancy—would likely be an incomplete and less effective response. Ideally, interventions addressing issues more akin to social inequalities should not be pitted against those targeting biomedical risk factors. However, historically, our emphasis has been heavily weighted to biomedical approaches. The lack of improvement in health disparities in general and in PTB specifically using this approach indicates that the time to elevate social justice approaches to the fore has come.

PREGNANCY

10. Preterm Birth Rate

- Rowland Hogue, C.J. & Silver, R.M. (2011). Racial and ethnic disparities in United States: Stillbirth rates: Trends, risk factors, and research needs. *Seminars in Perinatology*, 35: 221-233.

Spontaneous preterm birth contributes to a substantial proportion of stillbirths, especially intrapartum stillbirths at pre and peri-viable gestational ages. The most common scenario is spontaneous preterm labor at a previable gestation, for example at 22 weeks. Since the fetus cannot survive ex utero, cesarean delivery is not performed for the usual fetal indications and the fetus suffers an intrapartum death. The same condition would have led to obstetrical intervention with a cesarean delivery and a live birth if it happened at a gestational age compatible with ex utero life, for example at 28 weeks' gestation. Several obstetrical complications contribute to spontaneous preterm birth, including cervical insufficiency, preterm labor, chorioamnionitis, preterm premature rupture of membranes, and abruption. There is considerable overlap among these conditions and it is not always possible to isolate a single causative condition. Nonetheless, spontaneous preterm birth is remarkable for having profound and consistent racial disparity. In 2007, in the United States, the rate of preterm birth in non-Hispanic blacks was 18.3% compared with 11.5% for non-Hispanic whites. Most of these are spontaneous preterm births. As stated earlier, Willinger and coworkers have shown that obstetrical complications, such as spontaneous preterm birth contribute more to the stillbirth hazard in blacks than whites. Also, Gold and colleagues attributed most of the increased risk in stillbirth in black couples (compared with white couples; odds ratio 2.11) to prematurity and low birth weight in a large California cohort. Accordingly, spontaneous preterm birth is another very important area of focus for efforts to reduce racial disparity in stillbirth.

11. Quantity of Prenatal Care

- Folger AT, Carlson D, Besl J, Lordo KL. Hamilton County Maternal and Infant Health Assessment, 2007-2009. Hamilton County, Ohio: Hamilton County Public Health, Department of Community Health Services. August 2012.
- Phillippi JC. (2009). Women's perceptions of access to prenatal care in the United States: A literature review. *Journal of Midwifery & Women's Health* 54: 219-225.

There have been several approaches to examining the effectiveness of prenatal care. It is difficult to quantify the value of prenatal care in improving maternal and neonatal outcomes because of a large number of confounding influences. Many studies have examined the value of individual procedures or interventions on maternal and neonatal outcomes. These studies have substantiated the benefit of certain interventions, such as smoking cessation counseling, without validating the overall experience of prenatal care.

Another approach to studying the effectiveness of prenatal care pairs use of care with maternal-fetal outcomes, determining if women with specific amounts of prenatal care have better perinatal outcomes. Several indices of prenatal care "adequacy" have been developed, tested, and revised based on this methodology. The four major indexes currently in use differ markedly in their categorization of the adequacy of care, but all are based on the beginning, timing, and number of prenatal visits.

No current index includes the content of the visits or accounts for a reduced visit schedule of care. The content of visits may be more important than the overall number of encounters and can greatly affect the effectiveness of care. Alexander and Kotelchuck, prominent researchers on prenatal care adequacy, have called for a more uniform and comprehensive approach to determining the adequacy of prenatal care, which includes the number and timing of visits, content, provider, setting, and quality. Because this article focuses on women's perspective of access, and because the concept of adequacy is not clearly defined within the literature, adequacy will only be discussed within the context of maternal report or as a general measure of the use of prenatal services.

What constitutes positive perinatal outcomes is also controversial. Much of the recent research has focused on reducing the incidence of low birth weight infants and preterm births. However, while prenatal care may not decrease the rate of preterm birth, it may allow for the preparation for a preterm birth including transfer to an appropriate level facility and administration of corticosteroids to promote lung maturity, resulting in lower rates of neonatal mortality. Early prenatal care may also reduce rates of infant death and long-term disability through prenatal diagnosis of fetal anomalies.²⁹ Kennedy³⁰ has questioned whether research should study the rate of negative outcomes or, instead, determine if perinatal care increases the rate of optimal, or ideal, outcomes.

Comprehensive prenatal care may impact health behaviors, such as exercise, healthy eating, and weight control, whose effects might be difficult to assess in the short term. Kotelchuck³² has called for the greater inclusion of mother's voices in future research in order to reveal links between maternal experiences or behaviors and health outcomes. While there are many problems with the current literature on the effectiveness of prenatal care, all major health organizations, including the WHO and the CDC, support open access to prenatal care as an essential component in improving maternal and infant outcomes; therefore, it is important to hear the voices of women and learn what barriers they face in accessing these services.

12. Maternal Smoking Rates

- Rowland Hogue, C.J. & Silver, R.M. (2011). Racial and ethnic disparities in United States: Stillbirth rates: Trends, risk factors, and research needs. *Seminars in Perinatology*, 35: 221-233.

Smoking during pregnancy varies by race and ethnicity. In 2004, among women delivering in 26 states participating in the Pregnancy Risk Assessment Monitoring System, smoking during the last 3 months of pregnancy was highest among Native Americans (20%), followed by non-Hispanic whites (16%), non-Hispanic blacks (10%), Hispanics (5%), and Asian/Pacific Islanders (4%). Smoking may increase the risk of stillbirth by 20% or more, and in populations where smoking is common, smoking may account for much of the difference observed between populations. Smoking also exacerbates the already-high stillbirth risk among older women.

Preventing smoking during pregnancy should reduce stillbirth incidence among smokers. Stillbirth risk is not elevated if women stop smoking before pregnancy or in the first trimester, and nicotine replacement therapy appears not to be a risk factor for stillbirth.

Although smoking prevalence among black women is much less than among white women, smoking may still contribute to the racial disparity in stillbirth. Serum cotinine level is negatively associated with birth weight, preterm delivery, and infants' neurobehavior at 5 weeks after birth. Black women have higher serum cotinine levels than white women who smoke the same number of cigarettes, thereby

increasing the risk associated with smoking among black women disproportionate to their cigarette consumption.

- Flenady, V., Koopmans, L., Middleton, P., Froen, J.F., Smith, G.C., Gibbons, K., Coory, M., Gordon, A., Ellwood, D., McIntyre, HD., Fretts, R., & Ezzati, M. (2011). Major risk factors for stillbirth in high-income countries: A systematic review and meta-analysis. *The Lancet*, 377, 1331-1340.

This systematic review shows that a large proportion of stillbirths in high-income countries are attributable to risk factors that are fully or partly avoidable. These findings indicate the possibility for substantial rate reductions.

Obesity is one of the leading factors contributing to the overall burden of disease worldwide. With growing evidence of a causal relation between obesity and various adverse pregnancy outcomes, strategies that increase the proportion of women entering pregnancy within the optimum weight range is a priority for high income countries. Further research is urgently needed to identify the most useful approaches to weight management before, during, and after pregnancy.

Other important factors that contribute to stillbirth in such countries are maternal age over 35 years, primiparity, and smoking. The risk of stillbirth increases in all women with gestational age but more so in women older than 35 years. Although advanced maternal age is associated with increased risk of obesity, acquired medical disorders, such as diabetes, infertility, the use of reproductive technologies, and multiple gestations, it is an important independent risk factor for stillbirth. Improved community awareness of the associated risks might lower the proportion of women becoming pregnant at older ages. Although, primiparity cannot be removed as a risk factor, early detection of other risk factors and emerging complications (eg, pre-eclampsia and fetal growth restriction) could reduce the risk of stillbirth. Smoking cessation programs in pregnancy are effective and efforts to increase implementation are needed. This analysis confirmed the increased risk associated with maternal reporting of smoking in early pregnancy. We were unable to assess the effect of quitting in early pregnancy on stillbirth risk, but pregnancy outcomes for these women seem to be similar to those for nonsmokers. Therefore, although smoking cessation before becoming pregnant should be the goal, support for quitting should be part of routine antenatal care.

13. Previous Pre-term Birth

- Stock, S.J. & Norman, J.E. (2010). Management of a woman with a previous preterm birth. *Obstetrics, Gynaecology, and Reproductive Medicine*, 20 (6): 190-195.

Preterm birth is a major healthcare problem, with clinical, social and economic consequences. Reducing its impact is one of the challenges in modern obstetric practice. Preterm birth is defined as delivery occurring at less than 37 weeks gestation and although the lower gestational cut-off varies with location, in the UK the threshold of viability is usually accepted as 24 weeks. In the UK 7-8% of births are preterm, whereas rates in USA are 12-13% and in the developing world estimates are as high as 25-30%. Preventative strategies have been hampered by two factors. Firstly, prediction of preterm birth is difficult, so women usually present once the process of parturition has already started. Secondly, preterm birth is associated with multiple aetiologies, so a single approach unlikely to be effective. Infection, uterine overdistension, hemorrhage, stress and uteroplacental ischaemia have all been implicated in preterm birth, but the precise mechanism controlling the initiation of labor has not been

established. Nonetheless, research in this area has increased our understanding of the processes leading to preterm labor and revealed potential ways that may reduce preterm birth. Unfortunately, in many cases, interventions have not yet been shown to improve neonatal or longer-term outcomes, and caution must be used before instituting them without clear evidence of their benefit. As demonstrated by follow-up studies of clinical trials such as ORACLE (which showed an increase in cerebral palsy in children of women who were treated with antibiotics when they presented with symptoms of spontaneous preterm labor), therapies that we might expect to be beneficial can actually do harm. The aim of this article is to provide a case-based discussion of strategies to improve the outcome of pregnancies in women who have had a previous preterm delivery. Where there is lack of evidence of the best approach, management options are discussed and the need for further research is highlighted. This article primarily relates to preventative strategies for preterm labor. The management of women who present with symptoms of preterm labor is dealt with elsewhere.

14. Chronic Illness or other Co-morbid Condition During Pregnancy

- Fretts, R.C. (2005). Etiology and prevention of stillbirth. *American Journal of Obstetrics & Gynecology*, 193, 1923-1935.

The prevalence of maternal obesity is increasing steadily and is associated with an increased risk of fetal macrosomia and perinatal mortality. The reasons for this association are speculated to be due to behavioral, socioeconomic, as well as obstetric factors. Obese women are more likely to smoke and to have pregnancies complicated by gestational diabetes and preeclampsia. However, even when controlling for these factors, an elevated BMI remains a significant risk factor for stillbirth, and the association appears to increase as the gestation advances. A number of mechanisms for the increased risk seen in obese women have been postulated. Thinner women may be better able to perceive decreased fetal movements. Maternal obesity is also associated with hyperlipidemia, which may contribute to increased endothelial dysfunction, platelet aggregation, as well as to clinically significant atherosclerosis. Sleep studies of pregnant women have shown that obese women spend more time snoring (32% vs 1%; $P < .001$), have more apnea-hypoxia events (1.7 vs 0.2/h; $P < .05$), and have more episodes of oxygen desaturation (5.3 vs 0.3/h; $P < .005$) than non-obese pregnant women. Snoring has also been associated with pregnancy-induced hypertension and fetal growth restriction. Indeed, in addition to advanced maternal age and low socioeconomic status, as discussed previously, the most prevalent risk factor for stillbirth is pre-pregnancy obesity.

Hypertension and diabetes are 2 of the most common medical conditions to complicate pregnancy (7%-10% and 3%-5%, respectively). Historically, both of these conditions have been shown to be responsible for a significant proportion of fetal deaths. However, optimal management, including counseling, pre-conceptual care, and close medical management of these conditions, has been shown to reduce the risk for perinatal death to a level only marginally elevated over that of the general population. Management of patients remains a challenge, however, because of the increased risks of abruptio placenta, of intrauterine growth restriction, and of superimposed preeclampsia, which often necessitates early delivery.

- Rowland Hogue, C.J. & Silver, R.M. (2011). Racial and ethnic disparities in United States: Stillbirth rates: Trends, risk factors, and research needs. *Seminars in Perinatology*, 35: 221-233.

The worldwide obesity epidemic has serious consequences for maternal and infant health. In most epidemiologic studies, women are defined as overweight or obese by BMI (or weight in kilograms divided by height in meters squared) of 25.0-29.9 or 30.0+, respectively. Maternal obesity is associated with hypertension, diabetes, and other chronic conditions related to poor pregnancy outcome. Overweight and obesity may exacerbate already-high risks of stillbirth associated with type 2 diabetes and multiple pregnancies. Obesity is also associated with prolonged gestation which, without obstetrical intervention, is related to greater risk of intrapartum stillbirth. For these reasons, higher prepregnant BMI has been associated with an increased risk of stillbirth in most published studies.

Obesity is more common among African-American women, and obese African-American women may have greater risk for stillbirth when compared with white women of similar BMI. In Missouri, after statistical adjustment for maternal age, educational achievement, marital status, smoking during pregnancy, adequacy of prenatal care received, fetal sex, and year of birth, the adjusted hazards ratio associated with non-Hispanic black women compared with non-Hispanic white women of the same weight group was 1.3 for BMI 30-34.9, 1.4 for BMI 35-39.9, and 1.8 for BMI over 40.

Chronic hypertension is associated with a 1.5- to 2.7-fold increase in the rate of stillbirth. In large part, this is attributable to an increased risk for superimposed pre-eclampsia in women with chronic hypertension. It is well established that non-Hispanic blacks have a greater rate of chronic hypertension than whites. The increased risk is approximately 2.6 fold. In Missouri early-onset pre-eclampsia in a previous pregnancy was associated with a 4-fold increased risk for stillbirth in the second pregnancy. The risk was greater for black than for white women, which suggested that disparities in health care for underlying chronic conditions may have contributed to the excess racial disparity.

YEAR ONE

15. Unsafe Sleep

- Hauck, F.R., Tanabe, K.O., & Moon, R.Y. (2011). Racial and ethnic disparities in infant mortality. *Seminars in Perinatology*, 35: 209-220.

Behavioral risk factors are also important with regards to SIDS. For instance, black subjects are twice as likely to place infants prone for sleep. Although the supine sleep position is the norm for American Indian or Alaska Native, Aboriginal Australian, and New Zealand Maori infants, there are high rates of smoke exposure and bed sharing in these groups, both of which place these infants at greater risk of SIDS. Hispanic subjects in general are less likely to place infants prone than black subjects. In the largest U.S. case control study, one-third of SIDS deaths could be attributed to prone positioning. The primary reasons for placing infants prone among blacks are concerns about choking while supine and the perception that infants are more comfortable and sleep longer when prone. In addition, black mothers are more likely to receive a prone recommendation at the delivery hospital than non-black mothers.

16. Breastfeeding

- American Academy of Pediatrics. (2012). Policy Statement: Breastfeeding and the use of human milk. Retrieved from:
<http://pediatrics.aappublications.org/content/early/2012/02/22/peds.2011-3552>.

Breastfeeding and human milk are the normative standards for infant feeding and nutrition. Given the documented short- and long-term medical and neurodevelopmental advantages of breastfeeding, infant nutrition should be considered a public health issue and not only a lifestyle choice. The American Academy of Pediatrics reaffirms its recommendation of exclusive breastfeeding for about 6 months, followed by continued breastfeeding as complementary foods are introduced, with continuation of breastfeeding for 1 year or longer as mutually desired by mother and infant. Medical contraindications to breastfeeding are rare. Infant growth should be monitored with the World Health Organization (WHO) Growth Curve Standards to avoid mislabeling infants as underweight or failing to thrive. Hospital routines to encourage and support the initiation and sustaining of exclusive breastfeeding should be based on the American Academy of Pediatrics-endorsed WHO/UNICEF “Ten Steps to Successful Breastfeeding.” National strategies supported by the US Surgeon General’s Call to Action, the Centers for Disease Control and Prevention, and The Joint Commission are involved to facilitate breastfeeding practices in US hospitals and communities. Pediatricians play a critical role in their practices and communities as advocates of breastfeeding and thus should be knowledgeable about the health risks of not breastfeeding, the economic benefits to society of breastfeeding, and the techniques for managing and supporting the breastfeeding dyad. The “Business Case for Breastfeeding” details how mothers can maintain lactation in the workplace and the benefits to employers who facilitate this practice.

17. Postpartum Checkup

18. Home Visitation and Community Health Workers

(The research on this one was mixed – some studies showed a positive impact, some showed no impact. There are wide variations in the type of practitioner and visits, making analysis challenging. Below are three review articles.)

- Shaw, E., Levitt, C., Wong, S., Kaczorowski, J., and The McMaster University Postpartum Research Group. (2006). Systematic review of the literature on postpartum care: Effectiveness of postpartum support to improve maternal parenting, mental health, quality of life, and physical health. *Birth*, 33 (3): 210-220.

Postpartum support was defined as an interpersonal interaction(s) between a postpartum woman and trained individuals or health care professionals. The support could be offered in several forms: telephone calls, individual home or clinic visits, or group clinic visits. We included studies in this review that examined women without previously identified mental or physical illnesses and that reported at least one of the following types of outcomes: maternal knowledge, attitudes and skills related to parenting, maternal mental health, maternal quality of life, or maternal physical health. Since the literature contains no consistent definitions, studies were included in the maternal mental health category if one or more symptoms of depression, anxiety, or self-esteem were reported; in the quality-of-life category if a quality-of-life measure was used that evaluated both mental and physical health; and in the physical health category if physical signs or symptoms such as fatigue or reproductive health outcomes were reported. Studies that reported only data on health services utilization without clinical outcomes were excluded. Maternal satisfaction with postpartum support programs was examined when it was reported in the included studies.

The universal provision of any postpartum support program to unselected low-risk women does not appear to alter any of the maternal outcomes examined significantly, despite the plethora of postpartum support interventions that have been examined. No evidence of effectiveness has been found with respect to maternal knowledge, attitudes, and skills related to parenting, maternal mental health, maternal quality of life, or maternal physical health in this population. In selected women, with previously identified risk factors, postpartum support programs show some promising results. Low-income primiparous women and those at high risk for family dysfunction showed improvements in parenting knowledge, confidence, or infant-child interaction with either nursing visits and case conferencing or frequent educational visits to a pediatrician. Whether these improvements translate into a reduced incidence of child abuse or neglect remains to be determined. The only study that examined these latter outcomes was conducted in low-risk women, and showed no benefits from extended hospital and home contact.

A similar pattern was seen in the studies that examined maternal mental health. When women at high risk for postpartum depression or family dysfunction were targeted for intervention, either nurse visits combined with case conferencing or a less intensive peer support program improved maternal mental health outcomes. Although one study did not select women with risk factors at the outset, when support was based on a detailed needs assessment, effectively identifying a higher risk group of women, statistically significant improvements in both postpartum depression and quality of life were seen.

It is difficult to evaluate the impact of postpartum support on mental health in primiparous women. They were only specifically targeted in one trial that reported this outcome, and that showed no impact on Edinburgh Postnatal Depression Scale scores from a single public health telephone call. Only high-risk primiparous women benefited from a program of nurse home visitation and case conferencing.

Similarly, the reduced pregnancy rates in young, unmarried, primiparous patients are consistent with our findings that targeted psychosocially high-risk women may benefit from postpartum support programs administered by pediatricians or nurses.

Given that only one other randomized controlled trial addressed maternal physical health, no conclusions can be drawn about the impact of postpartum support on this outcome.

As expected, both maternal satisfaction and costs were higher with home visitation programs. With the exception of the one trial involving women at high risk for family dysfunction, this increased satisfaction and costs did not translate into additional improved outcomes.

The trials in selected populations who are at risk have several limitations. The generalizability of these studies could be strengthened by repeating them in different geographical settings and by comparing other support approaches. Many of the parenting studies examined only parenting knowledge and confidence. They could be strengthened by using more definitive outcome measures, such as maternal infant interaction and child abuse and neglect. Finally, the labor intensive nature of these interventions may be difficult and costly to reproduce in many communities.

This review has several limitations. The exclusion of nonrandomized studies and studies conducted outside of North America and other developed countries limit the generalizability of our study and narrows its scope. Based on this review, we cannot conclude that universal postpartum support has no benefits. Since postpartum support is also recommended to improve infant outcomes, the final conclusion with respect to the overall effectiveness of postpartum support will require inclusion of such literature in subsequent reviews. There may be some infant benefits, including improved breastfeeding duration, which will be reviewed in conjunction with other breastfeeding studies.

Randomized controlled trials are limited in that they focus on predetermined measurable outcomes. Qualitative literature and nonrandomized controlled trial literature may add significant insights into the benefits of postpartum support. In addition, many of the interventions were of low intensity (e.g., a single telephone call or visit). A recent systematic review concluded that only intensive support from a health professional reduced postpartum depression. Postpartum support programs must be implemented in an appropriate cultural context, and thus the applicability of this review is limited to developed countries. Because we also excluded studies that reported only health services utilization without clinical outcomes, this area needs to be explored further.

In conclusion, at this time, no randomized controlled trial evidence is available to endorse universal provision of postpartum support to improve parenting, maternal mental health, maternal quality of life, or maternal physical health. Some evidence exists that selected high-risk populations may benefit from postpartum support. In these groups, home visitation may improve parent-infant interaction, whereas both high intensity home visits and less intensive peer support appear to be effective for maternal

mental health. Contraceptive teaching from health professionals in both the clinic and home setting seems to be effective at reducing repeat pregnancies in teenage mothers. Communities need to consider targeting specific populations at risk when allocating resources in an attempt to improve these outcomes.

- Kendrick, D., Elkan, R., Hewitt, M. (2000). Does home visiting improve parenting and the quality of the home environment? A systematic review and meta analysis. *Archives of Disease in Childhood*, 82: 443-451.

In total 1218 references were found from the searches; 102 studies fulfilled the inclusion criteria, of which 34 reported outcomes relating to parenting and the quality of the home environment. Seventeen studies reported HOME scores, 27 studies reported other measures of parenting, and 10 studies reported both HOME scores and other measures of parenting.

The five studies using HOME scores as an outcome measure which were not included in the meta-analysis included four which did not report any data relating to the HOME scores. Barnard *et al* claimed intervention group families had improved HOME scores at 12 and 24 months, Osofsky *et al* reported results relating only to a subgroup analysis within the intervention group, Marcenko and Spence reported no significant difference between treatment groups, and Shapiro claimed a significant improvement in HOME scores in the intervention group at 12 months. Olds *et al* reported non-significant differences in mean HOME scores between the treatment groups at 34 and 46 months.

Twelve of these studies reported significantly better interaction between mother and child in the intervention group, using a range of measures including greater observed involvement and reciprocal interaction, responsiveness to the child's behavior, the quantity and type of interaction between mother and child, greater observed conversation with the child, lower rates of reported difficulties in the mother-infant relationship, greater positive feedback and more praise of the child, and fewer negative interactions between mother and child, and a more positive attitude towards the child. Barker and Anderson reported receipt of intervention to be significantly associated with cognitive and educational environment within the home in some, but not all of the geographical areas evaluating the Child Development Program.

Five studies found no significant difference between the intervention and control groups in terms of mother-child attachment, maternal interaction with child, parental warmth, verbal praise, and engaging in shared activities with the child.

Seven studies reported outcomes assessing parental attitudes and actions towards child discipline. Three studies reported outcomes favorable to the intervention group; these included significantly less negative or punitive attitudes towards child rearing, and more "appropriate" answers to questions regarding the parents' handling of aggressive behavior in their child. Four studies did not find a positive effect in the home visited group on preference for the use of positive as opposed to negative motivation in disciplining the child, the extent to which the parents were authoritarian in their attitudes to child rearing, or use of physical punishment.

Five studies reported parents' developmental expectations of their child. Four reported significant differences favoring the intervention group in terms of more positive or more realistic expectations. Two studies reported outcomes related to mothers' teaching ability, both of which found intervention group mothers were significantly more involved in the child's schooling or provided more stimulation likely to

promote future success at school. Five studies reported parental stimulation of the child using books, games, or toys. Three reported significantly better outcomes in the intervention group

In total, six of the 27 studies reporting other measures of parenting failed to show positive results in the intervention group. Three of these studies reported significantly higher HOME scores in the intervention group, suggesting the intervention did have a positive impact, even if the other measures of parenting did not show significant improvements.

- Yonemoto, N., Dowswell, T., Sagai, S., Mori, R. (2013). Schedules for home visits in the early postpartum period (Review). *Cochrane Database of Systematic Reviews* 2013, Issue 7. Art. No.: CD009326. DOI: 10.1002/14651858.CD009326.pub2.

Description of the condition

The postpartum period, defined by the World Health Organization (WHO) as the period from childbirth to the 42nd day following delivery, is critical for both mothers and newborns. An estimated 529,000 maternal deaths occur worldwide each year because of pregnancy-related complications in the antenatal, intrapartum, and postpartum periods, especially in resource limited settings. These deaths are often sudden and unpredictable, with 11% to 17% occurring during childbirth itself and 50% to 71% occurring during the postpartum period. Maternal health problems commonly observed in the postpartum period include postpartum haemorrhage, fever, abdominal and back pain, abnormal discharge, puerperal genital infection, thromboembolic disease, and urinary tract complications, as well as psychological and mental health problems such as postnatal depression. The postpartum period is also critical for newborns. Every year approximately 3.7 million babies die in the first four weeks of life. Most of these infants are born in developing countries and most die at home. Nearly 40% of all deaths of children younger than five years old occur within the first 28 days of life (neonatal or newborn period). Just three causes infections, asphyxia, and preterm birth-account for nearly 80% of these deaths. Moreover, the postpartum period is a time of transition for women and their families, who are adjusting on physical, psychological, and social levels. In most developed countries, postpartum hospital stays are often shorter than 48 hours following a vaginal birth; thus most postpartum care is provided in community and ambulatory-care settings. Early intervention in the postpartum period may prevent health problems from becoming chronic with long-term effects on women, their babies, and their families.

Description of the intervention

The purpose of a home-visiting program is to provide support at home for mothers, babies, and families by health professionals or skilled attendants. However, a single clearly defined methodology for this intervention does not exist. Further, the term “home visiting” is used differently in various contexts. Since the 1970s, the length of hospital stay after childbirth has fallen dramatically in many high-resource settings. Early postnatal discharge of healthy mothers and term infants does not appear to have adverse effects on breastfeeding or maternal depression when women are offered at least one nurse-midwife home visit after discharge. Home-visiting programs provide breastfeeding and hygiene education, parenting and child health instruction, and general support to families, successfully addressing many of the barriers to access including transportation issues, initiation of timely care, and completeness of services. Several trials have assessed the impact of home-visiting programs, especially effects on child abuse and neglect in vulnerable families. Others focused on the effectiveness and cost-effectiveness of intensive home-visiting programs. Some home-visiting programs have specifically targeted high risk groups such as women suffering domestic abuse (intimate partner violence) or families that are

economically or socially disadvantaged. Home-visiting programs for high risk groups or those by child health nurses may include components during pregnancy and may continue over many months or years.

In 2009, WHO and the United Nations Children's Fund recommended home visits by a skilled attendant in resource-limited settings. In high-mortality settings and where access to facility-based care is limited, at least two home visits are recommended for all home births: the first visit should occur within 24 hours of the birth, the second visit on day three, and if possible, a third visit should be made before the end of the first week of life (day seven). For babies born in a healthcare facility, the first home visit was recommended to be made as soon as possible after the mother and baby return home with remaining visits following the same schedule as for home births.

A recent review demonstrated the effectiveness of community-based intervention packages in improving neonatal outcomes and reducing maternal and neonatal morbidity and mortality in resource-limited settings; home visiting is the one of the main components in each of these intervention packages. This review offers encouraging evidence of the value of integrating maternal and newborn care in community settings. We, therefore, did not include intervention packages of continuous care with components of antenatal or hospital care in our review.

How the intervention might work

In high-resource settings healthy women and babies are frequently discharged from hospital within one or two days of the birth, and in low-resource settings women may be discharged within hours of the birth or give birth at home. Potentially, home visits in the first few days of the birth by healthcare professions or trained support workers offer opportunities for assessment of the mother and newborn, health education, infant feeding support, emotional or practical support and, if necessary, referral to other health professionals or agencies. Postpartum visits may prevent health problems developing or reduce their impact by early intervention or referral. Home visits have improved coverage of key maternal and newborn care practices such as early initiation of breastfeeding, exclusive breastfeeding, skin-to-skin contact, delayed bathing, attention to hygiene (e.g. hand washing and water quality), umbilical cord care, and infant skin care. In addition, home visits may identify conditions that require additional care or check-up, as well as counseling regarding when to take the mother and newborn to a healthcare facility. Home visits may involve not only the assessment of the mother and newborn for physical problems but also assessment of maternal mental health, family circumstances and the home environment.

Depending on the context, home visits may take a non-judgmental and supportive role or amore directive approach in which the goals are to monitor family compliance with standards of parenting care and ensure the newborn's health and welfare. The type of approach used can influence the ability of the careers to engage mothers and newborns, resulting in acceptance or rejection of the help offered and potential for further disengagement.

Why it is important to do this review

Despite many studies and reviews, evidence regarding the effectiveness of different types of home-visiting programs in the early postnatal period is not sufficient. In some contexts once women have been discharged from hospital there may be no, or very limited postnatal follow-up. In higher-resource settings once women are at home, services may be provided by a range of health and social care agencies (newborn health visitors, social workers, pediatricians and general practitioners) and may be fragmented; postnatal home visits potentially allow continuity of care after hospital discharge and for the assessment and referral of the mother and newborn.

19. Postpartum Depression

- Field, T. (2010). Postpartum depression effects on early interactions, parenting, and safety practices: A review. *Infant behavior and development*, 33: 1-6.

This paper reviewed studies from the last decade on postpartum depression effects on early interactions, parenting, and safety practices, and on early interventions. The interaction disturbances of depressed mothers and their infants appear to be universal across different cultures and socioeconomic status groups and include less sensitivity of the mothers and responsiveness of the infants. Several caregiving activities also appear to be compromised by postpartum depression including feeding practices, most especially breastfeeding, sleep routines and well-child visits, vaccinations and safety practices. These data highlight the need for universal screening of maternal and paternal depression during the postpartum period. Early interventions reviewed here include psychotherapy and interaction coaching for the mothers and infant massage for their infants. Further observational research and studies on educational and therapeutic interventions are needed.

Depressed mothers appear to have at least two different styles of interacting including an intrusive, controlling and overstimulating style or a withdrawn, passive and under-stimulating style. Postpartum depressed mothers in comparison with non-depressed mothers touch their infants less frequently and in a less affectionate manner and more negative manner (e.g. rough pulling, tickling and poking). Infants of depressed mothers spend more time touching their own skin, which may compensate for their receiving less positive touch from their mothers.

Depressed mothers also differ on their vocal behavior, including the use of longer utterances, less repetition, more negative affect, fewer explanations, suggestions and questions and fewer references to their infants' behavior. Others have noted differences in the vocal timing of depressed mothers' responses to their 4-month-old infants' vocalizations. In this study, the duration of switching pauses in depressed mothers was longer, more variable and less predictable than the timing mechanism of the non-depressed mothers. The authors suggested that depression may play a role in reducing synchrony in depressed mothers' and infants' interactions, affecting the mother's ability to coordinate her vocal behavior with her infant's vocalizations and non-verbal behavior. Consistent with the observation that depressed mothers have less infant-directed speech is a finding that they do not show a shorter mean length of utterance for younger versus older babies, in contrast to non-depressed mothers. It is not surprising, then, that the infants of depressed mothers later show less expressive language and perform more poorly on measures of cognitive-linguistic functioning.