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Effect of Interventions on Infant Mortality Rates: A Systematic Review

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Effect of Interventions on Infant Mortality Rates: A Systematic Review

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Abstract

Infant mortality rate (IMR) is defined as the number of infant deaths per 1,000 live births. Infant mortality is the time period beginning with the infant's first breath and continuing until the first year of life. In 2006, 6.71 infants died in The United States of America (USA) for every 1,000 live births, compared with 6.86 in 2005 and 6.89 in 2000. Although the USA IMR has fallen steadily in recent decades, the nation still ranks 27th among industrialized countries. Further, IMR disproportionately affects racial and ethnic groups in the USA. Despite research about prevalence, predictors, interventions, and major efforts over the last decade, IMR has decreased slightly. The PICOT question in this review is as follows: Do interventions aimed towards at-risk mothers and infants reduce infant mortality during their first year of life in the United States? Risk factors and interventions focus on preventative prenatal care and postpartum education and care. This systematic review discusses and critically appraises research by experts who have evaluated the effectiveness of interventions to reduce rates. Based on the appraisal of peer-reviewed publications about IMR interventions, advanced practice and research recommendations have shown to reduce the rate of infant mortality. Recommendations include continuing research into areas such as inter-birth spacing and the efficacy of centering groups among women of similar gestation and resources. Based on the research evaluated, practice recommendations focus on patient outreach and education for those of low socioeconomic status. Safe sleep education is crucial to new mothers and women with infants. Education for adolescent women should focus on the importance of contraceptive use, health risks associated with smoking and substance use while pregnant, and utilization of health screenings before and during gestation. Having this information at an early age and early into pregnancy, women may develop confidence in making healthy choices as they progress towards motherhood.

Infant mortality rate (IMR) is defined as the number of infant deaths per 1,000 live births. Infant mortality consists of the time period beginning with the infant's first breath and continuing until the first birthday. It does not include miscarriages or abortions. In 2006, 6.71 infants died in USA for every 1,000 live births, a rate which is a little different from the 6.86 rate of 2005 or the 6.89 rate reported in 2000 (Chau-Kuang, 2011). Although the USA IMR has fallen steadily in recent decades, the nation is still ranked 27th among industrialized countries in an analysis of Health and Human Services (HHS) 2000 data. IMR disproportionately affects racial and ethnic groups in the USA. In 2000, infant mortality among African Americans occurred at a rate of 14.1 deaths per 1,000 live births, which is more than twice the national average of 6.9 deaths per 1,000 live births. The current IMR ranking of the USA is in large part due to the disparities which continue to exist among various racial and ethnic groups in this country, particularly African Americans (Chau-kuang, 2011). In spite of understanding about prevalence, availability of health care systems, and interventions, the IMR is not decreasing as expected. This systematic review discusses and critically appraises research by experts who have evaluated the effectiveness of interventions to reduce rates. Based on the appraisal of peer-reviewed publications about IMR interventions, we studied advance research and future interventions that may reduce the rate of infant mortality. The PICOT question for this review is as follows: Do interventions aimed towards at-risk mothers and infants reduce infant mortality during their first year of life in the USA? Studies about nursing and community interventions discussed focus on preventative prenatal care as well as postpartum education and care.

Methods

Secure and reliable databases were utilized to search for pertinent studies. Scholarly databases are found through libraries and universities such as CINAHL, Medline Plus,

psychology and sociology indexes, and those reputable websites were found through libraries and university holdings. Twenty-one articles were obtained for this systematic review. Key words of "infant mortality", "intervention", "risk factors" and specific interventions such as "progesterone supplementation" were utilized to narrow the results. Synonyms such as, "safe sleep", "prenatal risk factors" and "preterm and low birth weight" were also used to identify studies. Different databases had minor variations in the content of material found in searches. Other inclusion criteria consisted of specifying a region in the world to focus upon- the USA and more specifically, Ohio. In order to find the most recent research and data, our search was narrowed down to the past five years. Ensuring the publications were peer reviewed increased likelihood of accuracy of findings. Exclusionary criteria included outdated or irrelevant data, data about studies conducted outside the USA, and also any findings on abortions or miscarriages were not included. Infant mortality does not include fetal mortality as this study is concerned about any deaths occurring from the time the infant takes its first breath through their first year of life. Different causes of infant mortality such as congenital defects and diseases are further described in the table of evidence.

Review of Literature

Prevalence of Infant Mortality

Although researchers have found that some interventions have reduced the rate of infant death over the years, the prevalence of IM is still high. As described in the introduction, the USA infant mortality is ranked 27th among industrialized countries (HHS, 2000), with 6.9 deaths per 1,000 live births annually in the USA population and 14.1 deaths per 1,000 live births in the USA African American population (Chau-Kuang, 2011). Further, Ohio's IMR is 7.3 deaths for all races and ethnicities, which ranks Ohio forty-second among the states (Infant Mortality:

Summit County Better Birth Outcomes, 2015). IMR in counties in Ohio also vary. Locally, Summit County IMR is 5.91 deaths per 1,000 live births (Infant Mortality: Summit County Better Birth Outcomes, 2015). In comparison, Montgomery County has a higher rate of infant mortality and a similar population size. Their IMR is 9.03 deaths per 1,000 live births (Ohio Department of Health, 2013). Variations are due to socioeconomic status and poverty, teenage pregnancy rate, mothers who smoke, race, and low birth weight (Chau-Kuang, 2011).

Factors associated with Infant Mortality

Infant death is related to various risk factors including lack of prenatal care, unemployment, teen pregnancies, preterm birth, substance abuse, congenital defects, low birthweight, ethnicity and an overall lack of education regarding preventative lifestyle choices while pregnant. Families with unemployment may lack resources for basic needs and may be unable to find transportation to healthcare facilities or pay for prenatal care and routine appointments for the mother and baby. For example, a study about socioeconomic disadvantages and survival of infants with congenital heart defects, Kucik, Nembhard, Donohue, Devine, Ying, Minkovitz and Burke (2014), determined that utilizing specialized health care resources would improve the health and survival of infants. To prevent teen pregnancies, high schools and hospitals have developed parent education and childbearing classes that teach the responsibilities that come with raising a child to women who are at risk for becoming pregnant (Reaching out to teen moms, 2011). Preterm births are also risk factors that may cause long-term disabilities such as cerebral palsy, blindness, increased risk of cardiovascular disease, and diabetes (Farooq, 2014). Studying birth percentiles of gestational age and birth weight among preterm infants, Da Frè, Polo, Di Lallo, Piga, Gagliardi, Carnielli and others (2015) found that mortality rates declined when gestational age and birth weights escalated. Finally, researchers have also found

that maternal use of drugs and or alcohol throughout pregnancy can directly impact the fetal development during gestation and cause alcohol poisoning (Burd, Blair, & Dropps, 2012).

Race and Ethnicity

For some expecting mothers, race and ethnicity may impact health and gestation, increasing the likelihood of prenatal problems. For example, researchers have found health problems in African American and Hispanic women, especially during pregnancy, may result from the accumulative effects of stress and racism in the USA, even in the twenty-first century (Infant Mortality: Summit County Better Birth Outcomes, 2015). Further, stress affects fetal development, and although all women need to be cautious of this fact, women of race and ethnicity should have heightened awareness of racism and stress. "Stress has a powerful impact on the female reproductive system…that can render a woman vulnerable to an adverse birth outcome before she ever becomes pregnant" (Dominguez, 2011, p. 12).

Researchers examined multi-group differences in racial and ethnic disparities relative to preterm rate, gestational age, and overall infant mortality. After data collection, it was understood that not all medical advances have benefited all racial and ethnic subgroups to the same degree (Rossen & Schoendorf, 2014). Groups included non-Hispanic White, non-Hispanic Black, Mexican American, Puerto Rican, Cuban, Central or Southern American, Asian, and Pacific Islander. "Lower IMR's were found among Cuban, Central, and Southern American infants at approximately 7 infant deaths per 1,000 births and high mortality rates among non-Hispanic Black infants were 17.5" (Rossen & Schoendorf, 2014, p.1551). Although birth outcomes and IMR have generally improved over the past 2 decades, the decreased risks have not been distributed equally across racial and ethnic subpopulations. When interventions that improve infant health are not used across ethnic and race groups, a negative impact on disparities

is likely to happen because the benefits of prolonging gestation are not accessible to all mothers similarly.

Communities are beginning to recognize differences among ethnicities that cause an immense amount of stress in regards to gestation and infant care. Support groups allow African American women a time and place where they can gather together and discuss any issues while supporting one another throughout their pregnancy (*Infant Mortality: Summit County Better Birth Outcomes,* 2015). Creating an opportunity for women of the same race to join together encourages empowerment, which can ultimately lead to healthier mothers and infants due to their extended social support.

Teen Pregnancy

The School of Public Health at the University of Massachusetts has done research on teen pregnancy by looking closer at contraceptive information and education aimed at the teen population. Health promotion materials and policy documents from a national, non-governmental teen pregnancy prevention organization helped identify strategies for management of teen pregnancy (Barcelos, 2014). Evidence showed an increase in contraceptive use when activities involving adolescents and education on health promotion were used. As a result, advertisements for contraception use have been geared towards adolescents, as well as young adults, who aren't ready to have a child but are at greatest risk for having an unplanned pregnancy (Barcelos, 2014). In addition to learning the new role as a teenage mother, stressors from negative connotations associated with teen pregnancy are present and campaigns try to highlight that lifestyle in hopes of reducing the rates of teen pregnancy (Barcelos, 2014). A nationally created project, Count It Up, explains the financial costs of teen pregnancy in each state or county and implies that public assistance to low-income families rewards irresponsible behavior (Barcelos, 2014). Rather than a

strategy to improve well-being for vulnerable members of society, this campaign feels interventions to reduce teen pregnancy include broadcasting the lives of teen moms and hoping other teens learn to engage in safe sex practices, such as contraceptive use. The strategy encouraged discussion of teen pregnancy among the public, but did not impact the rate of teens becoming pregnant.

Pregnancy Ambivalence

Pregnancy ambivalence, or conflicted desire about having a baby, has been associated with decreased contraceptive use and unintended pregnancy, especially in the teen population. Women who have an unplanned pregnancy are less likely to seek care throughout their pregnancy and follow healthy prenatal practices. National representative data from 2008-2009 was used to examine pregnancy ambivalence and its association with contraceptive practices among women 18-29 years old (Higgings, Popkin, & Santelli, 2012). The researchers looked at women who reported avoiding pregnancy, but would be happy if they got pregnant and those women who did not care or were indifferent. Specifically, Higgins and colleagues (2012) examined age-groups most affected by unintended pregnancy in the USA, pregnancy intentions, attitudes, feelings, and genders. Psychosocial variables included pregnancy fatalism and infertility fears. Overall, data analysis showed that 45% of respondents exhibited pregnancy ambivalence and 19% noted that no contraceptive methods were used (Higgings et al., 2012). Findings suggest the vulnerability of young adults to pregnancy ambivalence and the need for men to be involved in both prevention, research, and education.

Contraception Use Recommendations

According the Tepper, Marchbanks, and Curtis (2014), approximately half of all pregnancies in the United States are unintended. Unsafe behavior and lifestyle choices may

result in negative health outcomes for the fetus prior to the women discovering she is pregnant. The researchers shine light on contraceptive use by referencing the World Health Organization (WHO) and their evidence-based global guidance for contraceptive use. Medical Eligibility Criteria for Contraceptive Use (MEC) was developed by WHO and provides recommendations for the safety of contraceptive use among women with certain health risks including smoking, hypertension, and diabetes. WHO also developed the Selected Practice Recommendations for Contraceptive Use (SPR) that outlines how to use contraceptive methods (Tepper et al., 2014). Guidelines are available for health care providers so they can help their patients comply with contraceptives and alleviate stressors such as missing a dose. Information is available to women who face barriers in attaining health care and also the teen population (Tepper et al., 2014). Although data was not collected regarding patients and their status on contraceptive use, an increase in knowledge among health care providers using these guidelines was noted.

The Center for Community Solutions agrees contraception and education are key to reducing rates of teen pregnancy. Providing contraception to women at no cost would be the ideal solution; however, this is not a practice implemented throughout the USA. Providing education to teens and women about the benefits of their state's Medicaid Family Planning program would encourage the use of contraceptive care (Frech, 2014). Also, emergency contraception provides another option for women that prevents pregnancy and education should be provided throughout women's lives (Frech, 2014). Sex education is provided to both genders in the majority of school systems and is a necessary component of reducing teen pregnancy rates by as much as 17.3 percent (Frech, 2014).

IM Health Education Regarding Pregnancy

The majority of community interventions entail educating the public because a lack of knowledge contributes to IMR nationwide (Frech, 2014). Support service interventions include free text messaging services throughout the USA to pregnant mothers and new mothers with no access to affordable care (Whittaker et al., 2012). The purpose of the service is to inform women about prenatal and post-delivery care and behavior changes. Utilizing popular technology as a way to send important data to expectant and new mothers allowed for a high enrollment in the program. Further development of the service is under way, but the Text4Health study showed promise to reach high-risk populations and alter behavior change (Whittaker et al., 2012).

Smoking

In addition to comorbidities and lifestyle choices, different races have risk factors that put their children at high risk of premature births and infant mortality; this is especially supported in pregnant African American women (Kennedy, Genderson, Sepulveda, Dubuque, et al., 2013, p. 432). Presumably, African American women are predisposed to the risk of having high blood pressure, if they also smoke, this increases their chance of infant death greatly. Since maternal cigarette smoking is an important modifiable risk factor for adverse infant outcomes (e.g., low birth weight, preterm-birth and sudden infant death syndrome) (Batech, Tonstad, Job, Chinnock, Oshiro, Allen Merritt, & ... Singh, 2013 p.839), providing services for this population may decrease disparities and reduce IMR. In Richmond, Virginia, a social marketing campaign called "One Tiny Reason to Quit (OTRTQ) used a "quit line" counseling telephone smoking cessation intervention for pregnant African American smoking women (Kennedy, et al., 2013 p.432). During phone calls, volunteers discussed the risks of smoking for the infant's health, reassured mothers that calling the quit line was an important first step, allowed the woman to talk about

feelings of guilt about smoking during the pregnancy, sent literature on secondhand smoke to the women's families and discussed the benefits of staying smoke-free postpartum (Kennedy, et al., 2013). Decreased adverse outcomes in newborns was not illustrated in the study, but statistical data included described a 137-434% increase in pregnant callers during or after the campaign was broadcasted in Virginia during 2009 and 2011 and educational literature was distributed (Betech et al., 2013). "Smoking cessation programs for pregnant women may increase the number of women who quit during pregnancy but also reduce adverse infant outcomes (Batech, et al., 2013).

Substance Abuse

As previously described, **s**ubstance abuse is related to maternal and infant health, infant mortality, birth defects, and alcohol syndrome in infants (Burd, Blair, & Dropps, 2012). As a result, researchers have studied the effects of individual-level substance use and abuse, and infant health during pregnancy and following birth. For example, researchers from the North Dakota Fetal Alcohol Syndrome Center determined the effect of alcohol levels in body fluids (rates of alcohol elimination) in mothers, aiming to decrease long-term effects the alcohol has on cognitive deficits in newborns and infants (Burd, Blair, & Dropps, 2012). They found that "within two hours, the fetus' blood alcohol level equals the maternal mothers' through diffusion across the placenta. Ethanol exposure time is prolonged due to accumulation in the amniotic fluid" (Burd, Blair, & Dropps, 2012 p652). They concluded that prenatal alcohol exposure is directly related to intellectual disabilities, growth impairments, and stillborn births. Moving forward, the research suggests improving detection by screening women for alcohol use and offering support and education on alcohol cessation (Burd et al., 2012).

Delivery Locations

Although it is important to respect patient autonomy, recognizing possible complications for the mother or infant may guide decisions like where the family may choose to give birth. Malloy (2010) conducted a study to determine infant outcomes in hospitals versus home births by certified nurse midwives. The common trend is to deliver infants in hospitals, although home births are typically more affordable, calming and overall more satisfying (Malloy, 2010). After analyzing infant birth and infant death files according to places of birth, Malloy (2010) found that deliveries at home with certified midwives were connected with increased risk of mortality. The practice implications include assessments of pregnant women to identify high risk co-morbidities or foreseeable complications and then providing information to the women so they could decide where to deliver (Malloy, 2010). Noted in the study, high-risk pregnancies, including expectant mothers with hypertension and diabetes, should be delivered in hospitals where care is better-rounded and resources are readily available in the occurrence of a life-threatening event. Healthcare facilities would be responsible for identifying any risks, but ultimately it is the mother's decision.

Safe Sleep

Researchers have studied the effect of safe sleep education on infant outcomes. Mason, Ahlers- Schmidt and Schunn (2013) observed newborn sleeping habits in hospitals and instructed nursing staff to provide bundled care to first-time parents, addressing environmental factors and appropriate sleeping positions for newborns. Environmental factors included limitations on bedding pacifiers, stuffed animals in cribs, safe sleeping positions (positioning newborns on their backs), and restricted co-sleeping (Mason et al., 2013). In addition, videos and pamphlets were

provided in post-partum rooms to promote education and discussion throughout hospital stays. Prior to any intervention, only 25% of infants were sleeping safely. After nursing staff provided education and modeled appropriate behavior when caring for the newborns, safe sleep in newborns increased to 58.2% prior to discharge (Mason et al., 2013). The bundled approach improved safe sleep education and increased consistency with the teaching of safe sleep messages between nursing staff in the hospital setting.

In a 2000 to 2002 cohort study of singleton live births in the U.S., Carlberg and colleagues (2012) found that close to 400 deaths occur annually due to suffocation and strangulation in beds. These deaths most often occurred due to accidental overlay by parents, child suffocations from soft bedding and sleeping face down, strangulations from a cords or entrapments between mattresses and walls. As far as maternal predictors, the researchers found that mothers who had lower educational attainment, were younger when they gave birth, smoked, and or had multiple children had a higher incidence of infant mortality (Carlberg et al., 2012).

Hormones, Antibiotics and Vaccinations

Researchers have investigated the effect of hormones, antibiotics and vaccinations to protect mothers and babies throughout pregnancies to long after birth. With proper education about the benefits of each, women are empowered to decide if they want to use these types of treatments. For example, hormones like progesterone, have been found to reduce the incidence preterm labor/birth and can help prolong pregnancy. (Faroog, 2014). Routine (betamethasone) administration to women at risk for preterm birth before 34 weeks gestation has been found to accelerate fetal lung maturation, which decreases incidences of other neonatal morbidities and mortalities that are caused by prematurity. Based on evidence, routine betamethasone

administration is now recommended by the American College of Obstetrics and Gynecologists (Salim, Suleiman, Colodner, Nachum, Goldstein, & Shalev, 2016).

Interventions using antibiotics have been studied because pregnant women may have a specific bacterium, group B *streptococcus* (GBS), that can cause sepsis, pneumonia, and neurologic complications in infant development when it is transferred from mothers to newborns either in utero or during childbirth (Field, 2011). GBS transmission prevention includes administration of antibiotics to patients during labor if they have a positive GBS screen during the current pregnancy, unless it is a planned cesarean delivery (Field, 2011). Next, administering combination vaccinations for diseases such as diphtheria, tetanus, pertussis, polio virus and Haemophilus influenza type B has been found to prevent respiratory illness later in life for infants (Hansen, Timbol, Lewis, Pool, Decker, Greenberg, & Klein, 2016). Finally, researchers have found that combination vaccines do not introduce unexpected safety risks, but have been found to increase compliance with recommended immunization schedules (Hansen et al., 2016). Further, combination vaccines reduced pain affiliated with vaccinations because there are reduced numbers of injections to comply with infant wellness checks (Hansen et al., 2016). The implications of these findings include teaching women and families how immunizations can prevent serious diseases in newborns and that being immunized will outweigh the consequences of vaccinating their children.

Case Management

Researchers have also stated that increasing access to health care and reducing high risk behaviors are not enough to substantially reduce the IMR, based on consistent findings that "social class and stress are the major predictors of poor birth outcomes (as well as) socio-economic status (SES), education, occupation and income" (Livingood, Brady, Pierce, Atrash,

Hou, & Bryant III, 2010, p.383). The researchers concluded that primary prevention is the most effective way to prevent IMR in the long run, and multiple strategies were discussed within the systematic review conducted. One primary prevention intervention used case managers to individually tailor intervention strategies for women considered at high risk (previous poor birth outcome, adolescents and women of childbearing age). Livingood and colleagues (2010) measured outcomes of substance use and stress in relation to social class. Another strategy involved providing outreach programs and education to support women in need of well- women and prenatal care (Livingood et al., 2010). Results showed a decreased incidence of low birth weight, lower sexually transmitted infection rate, and a decreased IMR (Livingood et al., 2010). Developing education for the public regarding health behaviors such as smoking, drinking, multivitamin use, contraceptive use, etc., while also being cognizant of health conditions such as obesity, hypertension, anemia, etc., can help put a focus on those at risk for pregnancy related problems which may lead to infant mortality (Livingood et al., 2010).

Community-level interventions.

Community interventions have aimed to educate populations across a bigger scale. The focus of these interventions have been to provide information, support, and ease of healthcare access regardless of socioeconomic status, race and other social disparities. Examples include formal health classes for high school students (Reaching out to teen moms, 2011) to learn about contraceptives and what pregnancy will entail (Whittaker, Matoff-Stepp, Meehan, Kendrick, Jordan, Stange, & Rhee, 2012). Health promotion interventions for women of childbearing age have been studied in primary care and OB/GYN settings (Rowland Hogue & Vasquez, 2002). In general, educational interventions teach about abstaining from harmful substances (Burd et al., 2012), resting, going to routine checkups (Kucik et al., 2014) and attending to any pre-existing

conditions or diseases (Livingood, 2010). As a result, researchers have found that by intervening across various levels of awareness through advertisements, assessing women of childbearing age and providing education, the risk factors related to IMR has decreased nationwide over the last decade.

Gaps in Knowledge

There are gaps in knowledge about IMR's, stemming from lack of research in specific individual and community level interventions and limitations in previous studies. Researchers frequently used samples of pregnant women who were at high risk for preterm birth (Livingood et al., 2010) or those at higher risk of stress due to socio-economic factors (Kucik et al., 2014), which decreases generalizability of findings. However, researchers did report consistent findings about the effects of interventions such as smoking quit lines (Kennedy et al., 2013), Text4baby messaging service (Whittaker et al. 2012), betamethasone treatment (Salim, 2016), and progesterone supplementation (Farooq, S. (2014) on reduced IMR. Such interventions have decreased preterm birth rates and increased understanding of risk factors and the lifelong complications associated with preterm birth (Chau-Kuang, 2011). After reviewing research journals, however, the majority of published research identified risk factors that lead to infant mortality. Consistently, researchers have found that some ethnicities, such as non-white Hispanic women (Rossen et al., 2014), and women of low socio-economic status (Chau-Kuang, 2011) were disadvantaged in regards to healthcare access and prenatal education. In addition, premature infants and newborns with low birth weights were found at high risk for infant mortality (Da Frè et al. 2015).

Additional research should be conducted to assess the efficacy of specific interventions, such as contraception use, to reduce IMRs. No research was obtained, but could have been

included to describe the impact of screenings for women of child-bearing age. For example, cervical, diabetic and hypertension screenings may aid in identifying risk factors for premature births. Screening both males and females for sexually transmitted infections and genetic disorders were not included in this study, but may also be effective methods of infant mortality prevention. Also, folic acid supplementation is another intervention that was not included, but may significantly reduce IMR based on evidence. Folic acid can help prevent neural tube defects during fetal development and is something health care providers should assess for compliance. Overall, however, the studies utilized in the systematic review have identified risk factors and applicable interventions that promise to decrease mortality rate across the nation.

Critical Appraisal of Evidence

Limitations were noted throughout studies. Underreporting of high risk behavior such as smoking (Batech et al., 2013) and substance use (Burd et al., (2012) was noted because women did not want to feel stereotyped and face judgement. Studies included singleton babies only (Da Frè et al., 2015) and excluded twins and other siblings (Carlberg et al., 2012). Research lacks long-term assessments of adherence regarding education provided within hospital settings (Mason, 2013). Other limitations were a lack of randomized sampling (Dietz, England, Shapiro-Mendoza, Tong, Farr, and Callaghan, 2010), (Livingood et al., 2010), (Malloy, 2010). Samples were limited to high risk women only (Livingood, 2010), and studies were predominately surveyed in urban communities (Kucik et al., 2014). Systematic reviews were utilized due to minimal research regarding interventions to reduce infant mortality within the restricted time frame (Rowland, 2002). Overall, systematic reviews were useful in identifying interventions for infant mortality, and health care workers are familiar with education topics to discuss with

different populations. However, systematic reviews were not helpful when trying to obtain statistics and effectiveness of research interventions.

Levels of evidence varied with different research studies. Forty-three percent of the research articles were Level Six: Single Descriptive or Qualitative studies. Twenty-eight percent were Level Five and Systematic Reviews of Descriptive and Qualitative Studies. Cohort and Case Control studies at Level Four and made up 14% of the studies. Finally, 9% of the studies generated from Level Three evidence. Controlled Trials without Randomization, and Randomized Control Trials accounted 6% of Level Two evidence based practice. Sample sizes ranged from five (Salim, 2016) to 1,335,471 subjects (Malloy, 2010). Half of the studies were conducted at single sites, while 35% included multiple states. Fifteen percent of the studies were conducted nationwide. Overall, studies providing education on reducing unsafe behaviors such as smoking, substance use, and lack of contraceptive use began to show that safe sleep increased along with patient compliance. Promoting healthy outcomes by increasing health behaviors should decrease IMR, and all studies suggest that with patient compliance, lower rates are possible nationwide.

Synthesis of Evidence

The current state of research continues to showcase IMRs throughout counties, states and nations. Research has focused on identifying risk factors related to infant mortality, but more intervention studies about maintenance and long-tern effects need to be conducted to support practice. Hospitals are a major opportunity for both patient education and research. Safe sleep is a major, current topic of conversation occurring in facilities among healthcare providers and families, and the compliance is noted in research to evaluate efficacy. Other new interventions in

reducing infant mortality includes centering and inter-birth spacing. Research has begun to evaluate the effect of patient education and prevention. Both interventions are explained below.

Recommendations

Recommendations for clinical practice based on evidence found in the research can be noted. Some recommendations include continuous patient education throughout gestation, patient outreach, and patient monitoring. Emphasis should be put on developing additional outreach programs to specific populations, such as smoking cessation programs to help women smoking during pregnancy. Education and identifying resources for women who have lower socioeconomic standing should be provided. Reduction in IMR can be achieved by teaching women and their partners about family planning, contraception use, and smoking cessation. (Frech, 2014).

Providing information to the target populations may also reduce IMR, but only if compliance is maintained. This may depend on the effectiveness of educational information which should be presented at the fifth grade reading level. Being mindful of avoiding healthcare terminology which is not common to the public may assist in avoiding confusion during education. Summarization at the end of teachings may also highlight the most important information. It is critical that healthcare providers ensure the target population receiving the appropriate education and understandings what they have been taught. However, since knowledge does not always lead to behavioral changes, nurses also need to recognize how to help people make long-term changes.

Furthermore, advancement of future studies can be made. During the analysis of research associated with infant mortality, there was difficulty finding specific interventions related to infant mortality. Recommendations for research associated with inter-birth spacing would be

useful. Inter-birth spacing refers to the time between births for mothers. Close births are associated with low birth weight and premature births, both components of infant mortality (Frech, 2014). Future studies should also assess compliance of safe sleep in the home health medical system. A new program in Ohio called Centering Pregnancy, provides maternal care, education, and support while aiming to improve birth and infant health outcomes in high risk communities by helping connect women with leaders and resources in the community (Wahowiak, 2015). This new community level intervention shows promise of reducing IMR's, but requires research and analysis for efficacy.

After evaluation of validity in articles regarding infant mortality in the USA, it is evident that not only risk factors such as hypertension play a role in infant mortality, but lifestyle choices and social demographics also have an impact. The promotion of health care in women of child-bearing age, expectant, or new mothers should be consistent by healthcare providers. Nurses should promote the use of birth control, how it is used, and when it can be used along with safe-sex practice for both genders. Nurses should educate expectant mothers on smoking and substance cessation, importance of hormone supplementation, if needed, and immunizations at wellness checks after birth. New mothers can be informed on standard prematurity health, the importance of safe sleep, and SIDS. These educational topics can help young women and mothers prevent negative health outcomes and help decrease IMR.

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Systematic Review Literature Summary Table

APA formatted reference[1]	Background of Clinical Problem. Purpose statement. Research question[2].	Clinical Practice Setting. Population, Sampling methods, sample size.	Design. Level of Evidence.	Evidence-based Findings	Practice & Research Implications	****Limitations[3]
1. Dietz, P. M., England, L. J., Shapiro-Mendoza, C. K., Tong, V. T., Farr, S. L., & Callaghan, W. M. (2010). Infant Morbidity and Mortality Attributable to Prenatal Smoking in the U.S. *American Journal Of Preventive Medicine*, *39*(1), 45-52. doi:10.1016/j.amepre.2010.03.009	Prenatal smoking rates continue to decline, and is one of the most prevalent preventable causes of infant morbidity. Estimates the proportion of preterm deliveries, term low birth weight deliveries, and infant deaths attributable to prenatal smoking What impact does prenatal smoking have on infants?	National Center for Chronic Disease Prevention and Health Promotion, CDC, Atlanta Georgia Singleton, live births 49 states used standardized smoking-related questions on the birth certificate. Logistic regression models analyzed data of weekly assessments N= 386,262 live births	Quasi-experimental time series design 3th step: Controlled trials without randomization	Women who smoked during pregnancy were more likely to be younger, unmarried, less educated, and non-Hispanic white, and have had three or more previous live births, have initiated prenatal care after the first trimester, and have had low or high weight gain during pregnancy (Deitz et al., 2010) Prenatal smoking was also associated with SIDS and preterm-related deaths. Infants born preterm or term low birth weight may	Promote healthy lifestyle habits for pregnant women. Begin programs that can assist clients with the cessation of tobacco products.	Under-reporting due to prenatal smoking data presumed to be self reported at delivery or taken from the medical record.

[1] Indicate if primary or secondary source and if quantitative, qualitative or mixed methods.

[2] Construct purpose statement and research question is not stated in article. Identify independent variables, dependent variables, and population.

[3] Identify independent variables, dependent variables, and population.
List limitations related to validity and reliability of methods and applicability of findings. Consider strengths and weaknesses of study.

				encounter challenging short- and long-term health problems, including neurologic, developmental, and neurosensory morbidities (Deitz et al., 2010).		
2 Chau-Kuang, C. (2011). Investigating Risk Factors Affecting Infant Mortality Rates in the United States. International Journal Of Technology, Knowledge & Society, 7(4), 119-128	IM rates have been decreasing over the years, but certain conditions prevent mortality rates from declining even further. To explain and outline risk factors of infant mortality in order to improve infant health. What are the risk factors involved in infant mortality on city and county level?	County level throughout the U.S. national natality data set from 2000-2006. Women who's children have passed from infant mortality due to: income, unemployment and poverty rate, mother's residence, infant rate, gestation age, maternal age, maternal education, low birth weight, hypertension and tobacco use. Retrospective cohort study- to compare incidences of IM among variables.	Non-experimental descriptive design 6h step: Evidence from Single Descriptive or Qualitative Study	The seven risk factors showing the largest influence on IMR were income; teenage pregnancy rate; percent of teen mothers who are smokers; percent of black teen mothers with age of 10-14; percent of newborns who weigh less than 2500 grams; percent of black teen mothers with age of 15-17; and percent of newborns with gestation stage less than 37 weeks (Chau-Kuang, 2011, p. 124)	Teach middle and high school students about contraceptive use and practicing safe sex. Education on health risks for mom and baby associated with prenatal smoking Programs for African American women to provide support and education during pregnancy.	Sample size not specified in study. The algorithm used to collect data from the natality database may have lacked accuracy if algorithm was inaccurate.

		N= does not specify specific amount of data from natality dataset.				
3 Farooq, S. (2014). Risk Factors of Preterm Labor and the use of Progesterone in Prevention of Preterm Birth. *JPMI: Journal Of Postgraduate Medical Institute*, *28*(2), 189-195	Preterm labor is highly associated with infant mortality, and long term cardiac effects if the infant survives the pregnancy. To determine effectiveness of progesterone in prevention of preterm birth. What are the risk factors in preterm labor and can progesterone treatment prolong the pregnancy?	Obstetrics and Gynecology Department at King Fahad Hospital in Saudi Arabia from 1/1/11-12/31/11. Women ages 24-37 that have labor pains from singleton pregnancies. Detailed examination that discovered exclusion criteria separated patients included in the study. N=567	Time series quasi-experimental design. 6th step: Evidence from Single Descriptive or Qualitative Study	Over half of the women that were a threat for preterm labor were from low socio-economic status (Farooq, 2014). Preterm labor was more common in first pregnancies. Progesterone reduced risk of delivery before 34 weeks and babies were born with an average birth weight.	Assessment of cervical abnormalities early on in gestation can allow for early progesterone intervention. Education of how the treatment works in women with low pre-pregnant weight, young maternal age, and previous miscarriages will lower prevent preterm births by informing patient of benefits.	Randomized studies with a control group and pre and post-tests allow for more reliable, accurate data collections and analysis. Sampling method
4 Livingood, W. C., Brady, C., Pierce, K., Atrash, H., Hou, T., & Bryant III, T. (2010). Impact of Pre-Conception Health Care: Evaluation of a Social Determinants Focused	Accessible prenatal care and targeting high risk behavior are not enough to reduce IMR's. Decide "outcomes of the social determinants component of a	Data collected in Jacksonville, Florida at: Florida Department of Health's Bureau of Vital Statistics, Florida Department of Heath's Sexually Transmitted Disease Bureau, Florida	A secondary data analysis design (to assess impact of Magnolia project) A quasi-experimental design (to assess birth outcomes associated factors between two	Low birth weight rate decreased IM rate decreased from 81.3 to 35.7 (Livingood et al., 2010)	Educating patients about the benefits and risks of health counseling, tobacco, alcohol and multivitamin use, physical abuse can reduce the risk of poor birthing outcomes.	Design type can include selection bias, threat to validity of testing. It lacks randomization which can weaken design. Small portion of the nation's pregnant

Intervention. *Maternal & Child Health Journal, 14*(3), 382-391. doi:10.1007/s10995-009-0471-4	multiple-determinants model of pre- and inter-conception care" (Livingood et al., 2010). Can the Magnolia Project reduce poor birth outcomes that are related to socio-economic status and stress with social and behavioral interventions?	Department of Health's Health Management System database, Magnolia client database, surveillance systems through the Duval County Health Department's Center for Health's statistics. Women who either had a previous poor birthing outcome, giving birth less than 15 years old, or being of childbearing age (15-44), irregular source of health care, substance abuse, history of mental health problems Purposeful sampling N=222	groups pre and post case management.) 6th step: Evidence from Single Descriptive or Qualitative Study	Lower STD rates reported in Magnolia clients.	Implementing a holistic approach addresses behavioral, environmental, and biological behaviors that impact gestation and birthing outcomes.	women were included in the program. Only high-risk women were included in the program.
5 Mason, B., Ahlers-Schmidt, C. R., & Schunn, C. (2013). Improving Safe Sleep Environments for Well Newborns in	Programs to reduce SIDS have been implemented but rates of sleep-related deaths are increasing.	Wesley Medical Center in Wichita, Kansas.	One-group posttest-only design. 6th step: Evidence from Single	Over half of the patients were found in a safe sleeping environment during random safety checks.	Affordable materials could become implemented in obstetrical offices.	Research analyzed from single location Single time of day data was collected

the Hospital Setting. *Clinical Pediatrics*, *52*(10), 969-975. doi:10.1177/0009922813495954	Improve sleeping positions and hospital environments. What are hospital interventions that can reduce sudden unexpected infant deaths including suffocation and strangulation?	Infants in the postpartum area of the hospital Collect sleeping baseline on all patients in the postpartum area, then routinely check on patient and make sleeping adjustments as necessary. N= 201	Descriptive or Qualitative Study	From the survey, mothers intended to comply with safe sleeping positions in a crib and not in the parent's bed once discharged home. Hospital interventions provided learning opportunities for parents to use at home.	Physicians could refer supine sleeping positions to parents. They are more willing to comply with something if a healthcare professional suggests it. Provide strategies to ensure babies sleep on their backs.	No long-term assessments Small sample size
6 Burd, L., Blair, J., & Dropps, K. (2012). Prenatal alcohol exposure, blood alcohol concentrations and alcohol elimination rates for the mother, fetus and newborn. *Journal Of Perinatology*, *32*(9), 652-659. doi:10.1038/jp.2012.57	Fetal alcohol syndrome is a very common disease among neonates and children due to alcohol consumption by women of childbearing age. Determining the rates of alcohol elimination in mothers and newborn can specify the degree of impact the alcohol has on cognitive deficits.	North Dakota Fetal Alcohol Syndrome Center. Pregnant women using alcohol and are increasing their baby's risk of perinatal alcohol exposure Systematic review article search strategy included using keywords such as blood alcohol level, prenatal exposure	Non-experimental Descriptive Design 5th step: Evidence from Systematic Review of Descriptive and Qualitative studies	Within two hours, the fetus' blood alcohol level is the same as the maternal mothers' through diffusion across the placenta. Ethanol exposure time is prolonged in the fetus due to pulmonary excretions accumulating in the amniotic fluid. The infant again ingests the alcohol through direct fetal swallowing and	Providing information in health classes for high school students can teach implications of drinking alcohol while pregnant can result in Fetal Alcohol Syndrome. Community-wide education programs can teach the public how critical abstaining from alcohol during pregnancy can	Literature compiled into systematic review could have been published before 2010 (five year accuracy limit) Blood alcohol concentrations varied in studies and could have been due to a lack of specification between the umbilical vein and artery.

	Does maternal consumption of alcohol impact newborn functioning and alcohol elimination rates?	delayed effects. Human studies included. Articles limited to year 2011. N=47		intramembranous absorption via osmosis. After birth, kidney function increases and more ethanol is excreted due to a lack of amniotic fluid that traps the alcohol.	impact their infant's health. Teaching alcohol-related birth defects in infants (cognitive defects and behavioral problems result).	
7 Kucik, J. E., Nembhard, W. N., Donohue, P., Devine, O., Ying, W., Minkovitz, C. S., & Burke, T. (2014). Community Socioeconomic Disadvantage and the Survival of Infants With Congenital Heart Defects. *American Journal Of Public Health,104*(11), e150-e157. doi:10.2105/AJPH.2014-302099	Certain risk factors that impact the fetus during the neonatal period are related to congenital heart defects at birth, which is a leading cause of infant mortality. Examine the association between infant survival with severe congenital heart defects (CHD) indicators of and community levels of socioeconomic status Does decreased access to pediatric facilities and low	Studies pulled from Arizona, New York, New Jersey and Texas birth defect surveillance programs. Live-born infants with one specific type of CHD (common truncus arteriosus, transposition of the great vessels, tetralogy of Fallot, atrioventricular septal defect, aortic valve stenosis, hypoplastic left heart syndrome, and coarctation of the aorta) Infants with CHD by 4 state	Non-experimental Descriptive Correlational Design (Retrospective cohort study) 6th step: Evidence from Single Descriptive or Qualitative Study	Being born to a mother with less than a high school education was associated with a poor infant survival. Higher infant survival with non-Hispanic White infants and population living under the poverty level. Having multiple characteristics that fall into different consensus tracts resulted in an even smaller opportunity at infant survival.	Increased access to surgical and/or medical intervention Utilizing specialized health care resources improve chances of survival. Educating mothers on where and how to utilize specialized health care. Ensuring hospitals promote a large quantity of pediatric cardiac surgeries can result in better infant survival outcomes. Implementing home visitation programs	No medical insurance information was found on the infant as survival rates could differ due to having insurance or not. An uneven number of infants came from urban communities- the percentage of suburban infants throughout the country were not involved in this study.

	birth weight influence infants with CHD's survival?	surveillance programs to state-specific linked birth defect and infant death files to determine vital status and to retrieve sociodemographic and socioeconomic variables. (Maternal race and age, infant's birth weight, parity and sex, parent's low-skill occupations, proportion of the population living below the federal poverty level, proportion speaking a language other than English at home, and per capita income.) N= 9,853 infants		Low socioeconomic status in addition to the community factors increased infant mortality significantly.	could identify additional infants who are at risk for infant death.	
8 Da Frè, M., Polo, A., Di Lallo, D., Piga, S., Gagliardi, L., Carnielli, V., & ... Cuttini, M. (2015). Size at birth by gestational age and hospital	Different geographic regions and ethnicities consider varying birthweights a predictor in neonatal outcomes.	All hospitals located in Lombardia, Lazio, Calabria, Friuli Venezia-Giulia, Tuscany and Marche (Italy).	Longitudinal- based cohort study 4th step: Cohort Studies or Case Control Studies	A large portion of infants were discharged alive and well from the hospital.	Implementing birthweight checks periodically throughout gestation can identify any adverse infant outcomes after delivery.	Twins, triplets (etc.) were not included in the study. Preterm birth is associated with intrauterine growth

mortality in very preterm infants: Results of the area-based ACTION project. *Early Human Development, 91*(1), 77-85. doi:10.1016/j.earlhumdev.2014.11.007	To decipher birth size percentiles in preterm infants in relation to infant hospital mortalities. Is there a relationship between very preterm infants' size and infant mortality?	Italian infants with gestational age between 22-31 weeks Questionnaire was used to gather information from the mother about pregnancy and demographic region. Then centiles were calculated through a multi-variable logistic regression analysis. N=1,600 for birthweight N= 1,088 for head circumference		Mortality decreased with increasing gestational age	Smaller chance of survival in infants born less than 28 weeks into gestation weighing less than the value associated with the second percentile.	retardation, and birthweight may not be accurate.
9 Dominguez, T. P. (2011). Adverse Birth Outcomes in African American Women: The Social Context of Persistent Reproductive Disadvantage. *Social Work In Public Health*, *26*(1), 3-16. doi:10.1080/10911350902986880	African American infants have the highest rate of mortality and birth defects within the nation. Examine African American women's reproductive disadvantages in a general overview	Social Work of Public Health, University of Southern California African American women Search of reliable articles through specified databases using key words.	Qualitative Study-Ethnographic research 5th step: Evidence from Systematic Review of Descriptive and Qualitative studies	Findings suggest American societies result in African American women delivering low birthweight babies which can potentially result in infant mortality. Racial gaps are present in health outcome results, but	Educate healthcare professionals about recognizing or becoming aware of sub/conscious prejudices that could inhibit their care they provide patients. Implementing stress therapy to patients,	Some articles utilized in study are ten years old and information could possibly be outdated.

	compared to other races. Why are African American women having higher rates of infant mortality in relation to genetics, socioeconomic factors, racism, and stress affecting pregnancy?	N= 54 articles		cannot be sole reason of infant mortality, as multiple variable come into place. Minorities receive less intensive care in inpatient hospital stays which could be due to sub/conscious prejudices and acceptance of racial stigmas. Social disadvantages, racial discrimination result in stress on the African American population which can further endanger the fetus as stress can impact all maternal physiologic functioning.	or offering support groups to them. Promote social equality by improving health care access	
10. Rowland Hogue, C. J., & Vasquez, C. (2002). Toward a Strategic Approach	The U.S. has increased their ranking overall in infant mortality,	School of Public Health, Atlanta, Georgia.	Quantitative Study: Prospective design.	Making the public aware of risk factors of infant mortality and promoting	Recognize minority setbacks in regards to health care systems and making	Small portions of articles collected for this systematic review are old, and

for Reducing Disparities in Infant Mortality. *American Journal Of Public Health*, *92*(4), 553-556. KucikDID WE END UP USING THIS ARTICLE??)	meaning the rates have increased. Examining interventions to decrease IMR. What are interventions that can decrease IMR's in the United States?	Articles/ research pertaining to resolving IMR's. To find relative articles through LexisNexis Academic University Database N= 49 research articles	5th step: Evidence from Systematic Review of Descriptive and Qualitative studies	infant saving techniques.	easier access to all populations and ethnicities.. Increasing contraceptive access to women and education. Delivering high risk infants into appropriate hospital care that includes machinery and medical care they may need after labor.	newer findings may be present.

11. Hansen, J., Timbol, J., Lewis, N., Pool, V., Decker, M. D., Greenberg, D. P., & Klein, N. P. (2016). Safety of DTaP-IPV/Hib vaccine administered routinely to infants and toddlers. *Vaccine, 34*(35), 4172-4179. doi:10.1016/j.vaccine.2016.06.062	Complexity of immunization programs result in decreasing compliance with immunization schedules, multiple vaccine injections and clinic visits, increasing fear and pain among infants. to assess the safety of DTaP-IPV/Hib combination vaccine routinely administered as part of clinical care to infants at Kaiser Permanente Northern California Is the combination DTaP-IPV/Hib vaccine safe for infant and toddlers and are there any unforeseen complications?	Kaiser Permanente Northern California (KPNC), an integrated healthcare organization all 2-month-old infants who received a DTaP-containing vaccine as part of routine clinical care in KPNC from the time of the first dose of a DTaPcontaining vaccine through either 6 months after their 4th dose, or until 24 months of age, whichever occurred first KPNC databases and medical records pulled eligible patients for the research study. Vaccinees were monitored any pre-specified outcomes such as seizures, encephalopathy, altered level of consciousness,	Observational, retrospective study 5th step: Systematic Review of Descriptive/ Qualitative Studies	Acute and chronic tonsillitis was increased after DTaP-IPV/but did not suggest a relationship to vaccine. Hypersensitivity reactions (urticaria) were considered related to DTaP-IPV/Hib and several subjects experienced seizures that were considered related to the vaccine. DTaP-IPV/Hib was not associated with new safety concerns.	The study did not detect any safety signals following DTaP-IPV/Hib and provides reassurance that DTaP-IPV/Hib administered as part of routine care is not associated with unexpected safety concerns. Utilizing the combination vaccine will increase compliance with immunization schedules, increase acceptance among parents, reduce the number of vaccine injections extra clinic visits, decrease fear and pain among infants and toddlers,	Review of all potential outcome events was not feasible for safety surveillance, so only pre-specified outcomes were measured. Unable to differentiate between outcomes which occurred acutely post-vaccination and those which occurred prior to vaccination without medical record review

		meningitis, hypersensitivity reactions, sudden onset autoimmune diseases, and type 1 diabetes. N= 14,042				

12. Batech, M., Tonstad, S., Job, J., Chinnock, R., Oshiro, B., Allen Merritt, T., & ... Singh, P. (2013). Estimating the Impact of Smoking Cessation During Pregnancy: The San Bernardino County Experience. *Journal Of Community Health*, *38*(5), 838-846. doi:10.1007/s10900-013-9687-8	Pregnant women in San Bernardino County have continued to smoke even after recognition of pregnancy. Aim of study was to evaluate the impact of smoking cessation during pregnancy and non-smoking on the prevalence of adverse infant outcomes (LBW and preterm) in San Bernardino County (SBC), California Is there an association between smoking cessation at pregnancy recognition and LBW and pre-term births and what are public health impacts (i.e., number of adverse birth outcomes avoided)	San Bernardino County (SBC), California All maternal demographic and behavioral variables regarding tobacco use for all birth certificates recorded in SBC for 2007-08 from California's Department of Public Health (CDPH) Birth Cohort Files. N= 2,785	Observational, retrospective study 5th step: Systematic Review of Descriptive/ Qualitative Studies	Relative to maternal smokers, a significantly lower risk of low birth weight and pre-term birth was found for non-smoking mothers and for mothers who quit smoking during pregnancy Exposure impact assessment indicating a single low birth-weight or pre-term birth in the county could be prevented either by 35 mothers quitting smoking during pregnancy or by 25 mothers being pre-pregnancy non-smokers There is an etiologic link between maternal smoking and adverse infant outcomes in SBC.	It is cost-effective to incorporate cessation services specific to all pregnant women in San Bernardino County (a study has been conducted already). Provide availability of enrollment in intensive smoking cessation programs for pregnant women.	Sample size limited to one county across the nation and is not a random sample of all births. Results may underestimate the prevalence of tobacco use during pregnancy because underreporting of cigarette smoking is higher among pregnant smokers

	of smoking cessation					
13. Salim, R., Suleiman, A., Colodner, R., Nachum, Z., Goldstein, L. H., & Shalev, E. (2016). Measurement of betamethasone concentration in maternal serum treated for fetal lung maturity; Is it feasible?. *Reproductive Biology & Endocrinology, 14*1-5. doi:10.1186/s12958-016-0142-4	The association between maternal serum concentration of betamethasone given for fetal lung maturity and perinatal outcome has not been investigated. To assess the ability of a specific ELISA kit to measure the concentrations of betamethasone in maternal serum and to examine the trend of sequential measurements in maternal serum after a complete course of betamethasone for lung maturity.	"university teaching medical center between July 2012 and April 2014". Pregnant women between 24 weeks 0 days and 33 weeks 6 days of gestation, had singleton gestation, and received a complete course of betamethasone due to threatened preterm birth were included in the study. All women in the hospital were allowed give consent to partake in	Quantitative Non-Experimental Study 6th step: Single Descriptive or Qualitative studies	The near to baseline concentration at 5 to 7 days is similar to the described perinatal clinical effect that is best achieved within 7 days after drug administration. There is a variation in the serum concentrations among women with singleton pregnancies and a fixed dosage, whether smaller or larger than the acceptable regimen, may not be sufficient to reduce perinatal	Betamethasone dosage and concentration in terms of benefit and safety to the developing fetus at any gestational age has not been established. The medication reduces mortality and morbidity in general, but its effect on a particular woman is usually unpredictable. However, the benefits outweigh the risks.	The extremely small sample size utilized results in difficulty finding significant relationships from the data. Lack of prior research studies on the topic.

	Does varying concentrations of betamethasone impact mothers and fetus' differently regardless of standard dose administered?	study except those who met exclusion criteria: received an incomplete course of betamethasone because failure to delay deliver, received corticosteroids for other reasons during pregnancy, had multiple gestations, or fetal malformations diagnosed in the antepartum period. N=5		complications among all women.		
14. Whittaker, R., Matoff-Stepp, S., Meehan, J., Kendrick, J., Jordan, E., Stange, P., & ... Rhee, K. (2012). Text4baby: Development and Implementation of a National Text Messaging Health Information Service. *American Journal Of Public Health*, *102*(12), 2207-2213.	Text messages to pregnant women across the nation are benefiting from helpful health care tips during pregnancy. Evaluation of effectiveness of texting service perceived by mothers and pregnant women nationally.	Throughout the U.S. Pregnant women, new mothers, and families All pregnant/ new mothers N= 109,201 women	Quantitative, grounded theory research, trend study. 2nd step: Randomized control trials	Higher enrollment rates occurred in zip codes 'with higher proportions of families living in poverty and of low-birth-weight babies Sending three text messages per week was an adequate amount. Enrollment of the Spanish speakers	Identify advertising strategies for reaching Spanish populations. Work with future changes to mobile phone pricing plans in order to continue free messaging or require a small cost Sending out more diverse messages that will continue to	There is a possibility that Spanish speakers opted for the English version, or the service was not effective on Spanish-speaking population. The cause of low enrollment of Spanish speakers was not determined.

doi:10.2105/AJPH.2012.300736	What are good aspects of the Text4Baby program that should continue to be implemented into future development?			was lower than expected.	promote positive behavior change.	Is not known whether the enrollees were those in need of the service.
15. Malloy, M. H. (2010). Infant outcomes of certified nurse midwife attended home births: United States 2000 to 2004. *Journal Of Perinatology*, *30*(9), 622-627. doi:10.1038/jp.2010.12	Home births are significantly less common than hospitalized births and are debated to put the mother and infant at an increased risk due to safety concerns. Examine the safety of certified nurse midwives attended home deliveries compared to in-hospital deliveries. Do at-home births have a high rate of infant mortality compared in in-hospital births?	University of Texas Medical Branch, Galveston, Texas Full term, vaginal births from 2000-2004 National Center for Health Statistics collected files from 2000-2004 and used those infants. N=1,335,471 births	Comparative design 3rd step: Controlled trials without randomization	In-home certified nurse midwife deliveries had higher risk of mortality. Congenital anomalies were the largest cause of infant death for in-hospital and at-home deliveries. Pregnancies that carried a higher risk (diabetes, hypertension, and other complications) were delivered in the hospital.	Assessing for risk factors throughout pregnancy can determine whether a patient should deliver at home or in the hospital. If there is a low risk pregnancy, then support of home birth can be given.	Only low-risk populations were assessed. Singleton deliveries were researched only. Lack of reporting pre-existing maternal medical conditions
16 Barcelos, C. A. (2014). Producing (potentially)	Although the rate of adolescent childbearing in the	Public Health, University of Massachusetts	5th step: Systematic Review of	Evidence shows how health promotion activities	Health promotions for the US related to teen pregnancy	Some data may have been excluded in analysis and may be

pregnant teen bodies: biopower and adolescent pregnancy in the USA. *Critical Public Health*, *24*(4), 476-488. doi:10.1080/09581596.2013.853869	USA continues to decline, and its consequences increasingly found to be equivocal, a persistent discourse of teen pregnancy as pathology structures public health responses. Analyze adolescent pregnancy and motherhood, and their discursive constructions in contemporary US society, through Foucault's concepts of biopower and governmentality.	Amherst, Amherst, MA, USA. Adolescent pregnant teenagers and mothers in the US. Author describes methods from National Campaign, Stayteen.org and Bedsider.org, research reports, web pages, videos, and health promotion materials to reduce teen pregnancy. The author focused on materials related to pregnancy prevention aimed at youth (both non-pregnant and pregnant), adults of childbearing age, policy-makers, and the general public.	Descriptive and Qualitative studies	are never neutral but rather are always implicated in existing discourses surrounding the state, the family, sexuality, and scientific knowledge production. Health promotion work on this issue does much more than attempt to prevent pregnancies: it demarcates (in) appropriate reproductive bodies, consolidates heterosexual power, produces ever-expanding at-risk populations, and calls on individuals and populations to work on their bodies in very specific ways.	prevention including contraceptive education. Use of compiled data to connect prevention activities to the dominant discourses of teen pregnancy in the USA.	older than five years.
17 Kennedy, M. G., Genderson, M. W., Sepulveda, A. L., Garland, S. L.,	The IMR among African Americans is double that of whites and maternal	Richmond, Virginia Pregnant, African American women	Non-experimental Descriptive Correlational Design	Campaign advertisements would reach members of its	Since the study, there is now a free, 24-hour national quitline for pregnant	The study did not address the question of whether media channels and

Wilson, D. B., Stith-Singleton, R., & Dubuque, S. (2013). Increasing Tobacco Quitline Calls from Pregnant African American Women: The 'One Tiny Reason to Quit' Social Marketing Campaign. *Journal Of Women's Health (15409996)*, *22*(5), 432-438. doi:10.1089/jwh.2012.3845	smoking causes low birth weight and preterm birth. The objective of the campaign was to encourage pregnant smokers to call a toll-free numberfor telephone smoking cessation (‘‘quitline’’) counseling. Will the quitline decrease the amount of pregnant women who smoke, and therefore decrease IMR?	who smoked during pregnancy A radio station that ran advertisements about the quitline and. The number of calls made in 2009 was contrasted with (a) the number of calls immediately before and after the campaign, and (b) the number of calls the previous summer N=28	(Retrospective cohort study) 6th step: Evidence from Single Descriptive or Qualitative Study	primary target audience successfully and motivate them to call. The importance of a positive tone from the quitline volunteer with high-risk pregnant women made them feel comfortable addressing smoking cessation.	women, 1-866-66(START), sponsored by the American Legacy Foundation and managed by the American Cancer Society, and 17 states have special quitline services just for pregnant women. Guaranteeing the continued availability of multisession quitline counseling to pregnant women would be a sound public health policy Promote quitlines to pregnant African American smokers in places where African American populations are large and racial disparities (IMR) are prevalent.	materials that target African American women are more effective at reaching and motivating them than general audience approaches. There was a sufficient amount of missing data on demographics and tobacco use to create the potential for instability in estimates.
18 Carlberg, M., Shapiro-Mendoza, C., & Goodman, M. (2012). Maternal and Infant	In the US, unintentional injuries rank as the third leading	United States Singleton live born infants delivered to	Longitudinal- based cohort study	A total of 11,719,232 singleton live births were born to US	Encourage supine sleeping for infants.	Differentiating accidental suffocation from SIDS and other causes of death that

Characteristics Associated With Accidental Suffocation and Strangulation in Bed in US Infants. *Maternal & Child Health Journal*, *16*(8), 1594-1601. doi:10.1007/s10995-011-0855-0	cause of post neonatal mortality following SIDS and congenital malformations.. Of all infant unintentional injuries, accidental suffocation and strangulation in bed (ASSB) is the most frequently reported cause of death accounting for nearly 400 deaths annually. To identify maternal and infant characteristics associated with accidental suffocation and strangulation in bed (ASSB) in US infants. Using 2000–2002 US linked infant birth and death certificate cohort files, we compared ASSB deaths to survivors.	US residents in 2000–2002 We used 2000–2002 linked US birth and death certificate cohort data. N= 1,064 infants	4th step: Cohort Studies or Case Control Studies	residents between 2000 and 2002. Of these, 10,078 infants were excluded because they died from SIDS, cause unknown, or other accidental suffocation. Additionally, 135,476 infants (7 ASSB deaths included) were omitted from the analysis due to gestational ages less than 20 weeks, birth weights less than 500 g, or missing values for birth weight or gestational age.	Motivate parents to not sleep with their child and encourage them to monitor their child's sleeping patterns.	cannot be explained by autopsy alone. Not all states are using the new birth certificate, and thus, data after 2003 are collected inconsistently across states thereby limiting its use for analysis.

	What are the underlying risk factors for ASSB and what interventions can be made?					
19. Higgins, J. A., Popkin, R. A., & Santelli, J. S. (2012). Pregnancy Ambivalence and Contraceptive Use Among Young Adults in the United States. *Perspectives On Sexual & Reproductive Health*, *44*(4), 236-243. doi:10.1363/4423612	There are high rates of unintended pregnancy among young adults (18-29). To explore pregnancy ambivalence and contraceptive use among young adults. Are the high unintended pregnancy rates due to decreased contraceptive use and/or conflicted desires to have a baby?	National Survey of Reproductive and Contraceptive Knowledge at the Guttmacher Institute from 2008-09. Unmarried 18-29 year men and women currently in a sexual relationship Random digit dialing of landline numbers and cell phones and participants were asked a field tested questionnaire available in Spanish and English N=774	Case Control/ Observational Study 4th step- Cohort Studies or Case Control Studies	45% of respondents exhibited pregnancy ambivalence (more men than women) and was associated with lower contraceptive use. Ambivalent men were less likely to use contraception.	Providing education to young men at their annual physicals, primary care physician would encourage contraceptive use and safe sex practices with their partners.	Analysis reported their partners contraceptive methods, and therefore, may have been inaccurate. Did not assess ambivalence toward contraceptive use.

20.Tepper, N. K., Marchbanks, P. A., & Curtis, K. M. (2014). U.S. selected practice recommendations for contraceptive use, 2013. *Journal Of Women's Health (2002)*, *23*(2), 108-111. doi:10.1089/jwh.2013.4556	Unintended pregnancy rates remain high in the US and there is an increased risk of negative health outcomes due to barrier to accessing and inconsistent use of contraceptives. Aims to reduce barriers to contraceptive use. What barriers do women face when accessing different forms of contraceptives and what do they need to know about using them?	World Health Organization created two programs, Medical Eligibility Criteria for Contraceptive Use (MEC) and Selected Practice Recommendations for Contraceptive Use (SPR) in which research was pulled from.	Systematic Review 6th step: Evidence from Single Descriptive or Qualitative Study	Women may need examinations prior to starting contraceptives, and need to schedule additional visits throughout use which may be difficult due to socioeconomic status. Women may discontinue usage due to side effects or missed doses.	Healthcare providers need to encourage contraceptive use. In addition, they need to assist the patient in managing issues and side effects while considering individual circumstances.	A lack of research regarding such barriers have not been studied sufficiently. The MEC was published in 2010, so data has not been updated.
21. Rossen, L. M., & Schoendorf, K. C. (2014). Trends in racial and ethnic disparities in IMR's in the United States, 1989-2006. *American Journal Of Public Health*, *104*(8), 1549-1556.	Differences in infant mortality by race and ethnicity have been noted since the early 1900s. To measure the overall disparities in pregnancy outcomes while noting data among different	Data from the Birth Cohort Linke—Birth-Infant Death Files from the U.S. vital statistics for 1989-1990 and 2005-2006. Non-Hispanic white, Non-Hispanic black, Mexican American,	Descriptive and Quantitative Design 6th step- Evidence from Single Descriptive or Qualitative Studies	Overall disparities among racial and ethnic groups in the US descreased by 10% over the noted time period. IMR decreased from 9.2 in 1989-1990 to 6.7 deaths per 1,000 from 2005-2006.	Continue to tailor gestational care towards different racial and ethnic needs. Technological advancement from 1989-2006 has reduced IMR, so conducting research on new ways to	Research was conducted over ten years ago, even though the study was produced within the last five years Inability to link a small percentage of infant deaths to their corresponding birth

doi:10.2105/AJPH.2013.301272	races and ethnic groups see how infant mortality has changed over time. How has infant mortality varied between races and ethnic groups in the US?	Puerto Rican, Cuban, Central or Southern American, Other Hispanic, American Indian and Alaskan Native and Asian or Pacific Islander infant death files under one year Premature infants born sooner than 37 weeks were not included.			decrease IMR should be studied.	certificate which means that IMR may be understimated for some subgroups. Accuracy/ completeness of gestational age may vary by race or ethnic group over time.