

The Role of Extremes in Interpregnancy Interval in Women at Increased Risk for Adverse Obstetric Outcomes Due to Health Disparities: A Literature Review



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Abstract: Background: The interpregnancy interval (IPI) defines the time between two consecutive gestations. In the general population, women with IPIs that fall outside the recommended 18-24 month range appear to be at modestly increased risk for adverse obstetric outcomes.

Objective: The aim of this review was to assess the impact of extremes in IPI in populations with an increased baseline risk for adverse obstetric outcomes due to disparities in health and health care, including racial and ethnic groups, adolescents, and those of lower socioeconomic status.

Methods: We conducted a MEDLINE/Pubmed literature search in February 2016. Identified articles were reviewed and assigned a level of evidence.

Results: The 24 studies included in our final review were mainly retrospective with considerable heterogeneity in definitions and outcomes that prevented a quantitative meta-analysis.

Conclusion: The results of our review suggest that at-risk populations may have an increased frequency of shortened IPIs though the impact appears to be moderate and inconsistent. There was insufficient evidence to draw meaningful conclusions regarding a prolonged IPI or the effect of interventions. Based on the current literature, underserved populations are more likely to have a shortened IPI which increased the incidence of prematurity and low birth weight in some groups though the effect on additional obstetric outcomes is difficult to assess.

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1. INTRODUCTION

The interpregnancy interval (IPI) refers to the time between the end of one pregnancy and a new conception. There is no universally accepted definition on what constitutes an appropriate IPI, though several recommendations exist. The World Health Organization (WHO) advises waiting at least 24 months before attempting pregnancy following a live birth [1]. In its Practice Bulletin "Prediction and prevention of preterm birth", The American College of Obstetricians and Gynecologists notes that the risk of preterm delivery is lowest with an interval of 18-23 months [2].

Extremes in IPI appear to increase the risk of complications with a J-shaped association curve [3]: those with short and long intervals are at increased risk for adverse obstetric outcomes compared to those in the center. Women with a shortened interpregnancy interval – typically defined as less than 18 months – have a greater chance of adverse obstetric outcomes, with those conceiving at an interval less than

six months at highest risk for spontaneous preterm birth, preterm premature rupture of membranes, small for gestational age infants, fetal demise and congenital anomalies [4, 5]. Data linking complications to a prolonged interpregnancy interval (generally defined as greater than 60 months) is less robust but does suggest an increased incidence of preeclampsia, reduced birth weight, and fetal death [6].

The effect of extremes in interpregnancy intervals may have long term implications for the mother and her offspring. While the evidence is conflicting [7], women with a short or long IPI may have an increased risk for developing cardiovascular disease [8], and a recent study reports an association between extremes in IPI and development of autism spectrum disorder in offspring [9].

While questions remain regarding the strength of association of IPI and adverse obstetric outcomes [10], women from traditionally underserved populations (here referred to as "at risk" populations) and those with impaired access to medical care – including prenatal care and contraception – may be more susceptible to the adverse effects of extremes in IPIs. African American women, for example, are twice as likely to deliver preterm and three to four times more likely to deliver

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very preterm compared to their non-Hispanic white counterparts [11]. These disparities persist despite the use of interventions such as progesterone to prevent recurrent spontaneous preterm birth [12]. African American women's risk for stillbirth is two-fold higher [13] and the incidence of placental abruption [14], fetal growth restriction [15], and pregnancy-related hypertensive disorders [16] remains considerably elevated compared to the baseline population. Notably, the pregnancy-related mortality ratio for African American women is more than double than that of the general population [17].

Knowledge of the impact of extremes in IPI in at-risk populations could lead to better obstetric outcomes through targeted interventions in patient education and improved access to care. We hypothesize that women at increased risk for adverse obstetric outcomes due to disparities in health and health care may be more susceptible to the effects of extremes in IPI and hence more likely to benefit from interventions.

2. OBJECTIVE

Our objective was to review the available literature to assess the impact of short and long interpregnancy intervals in U.S. women at increased risk for adverse obstetric outcomes, specifically those from underserved populations. We targeted our search to racial and ethnic minorities and those of lower socioeconomic status.

3. METHODS

We conducted a literature search in February 2016 using MEDLINE/PubMed inputting the search terms “interpregnancy intervals,” “short interval pregnancy,” “birth spacing,” “birth outcome,” “minority,” “underserved,” “insecurity,” “poverty,” “Medicaid,” “ethnicity,” “race,” “housing,” “black,” “Hispanic,” “Indians,” “native,” “Asian,” “Pacific Islander,” “Alaskan,” “Hawaiian,” “native American,” “Es-kimo native,” “Navajo,” “Muslim,” “Hindu”. Each article and its references were reviewed and assigned [18].

4. RESULTS

Our search identified a total of 47 articles (Fig. 1). Twenty-three articles were excluded; 10 did not meet the inclusion criteria because they included non-U.S. study populations [6, 19-27] and the remaining were not relevant to the clinical question. Twenty-four studies were included in our final review, summarized in Table 1. The most common study design was a retrospective cohort (Fig. 2).

There was considerable variability in defining an extreme IPI with studies using less than three, six, seven, 12, and 18 months to describe a shortened interval and studies using greater than 48 and 60 months to describe a prolonged interval. Many studies evaluating the impact of a short interval pregnancy compared one or more of the above ranges to those with an interval of greater than 18 months – a strategy that groups women with a prolonged IPI (and their associated complications) with the controls. Relatively few studies evaluated the impact of a prolonged IPI making it difficult to draw meaningful conclusions.

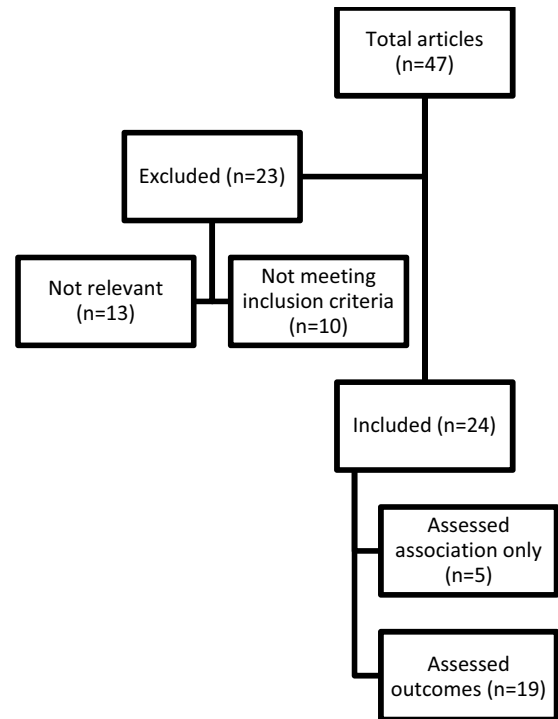


Fig. (1). Literature review process and search results.

As a result of the large degree of variability in definitions and the groups included in the studies, there was wide variation in reported frequency of extremes in IPI – ranging from seven to 37 percent [28, 29]. Because of the heterogeneity between studies, we were unable to perform a quantitative meta-analysis.

4.1. Outcomes Assessed

Twenty studies assessed outcomes associated with extremes in IPI. The most common outcomes evaluated were preterm delivery and birth weight (11 studies included one or both). Fewer studies evaluated additional outcomes including infant mortality, cesarean delivery rates, or the impact of interventions [30-33]. Only one study [34] assessed the effect of IPI and congenital malformations. While this study analyzed data from a large state database that included women of lower socioeconomic status and of varying racial and ethnic groups, the authors did not specifically evaluate the incidence of malformations in high risk subpopulations with extreme IPIs.

4.2. Groups Identified

Our literature search identified studies assessing interpregnancy intervals in African American, Medicaid, teenage, Cambodian refugee, and Hispanic/Latina populations. Not surprisingly, there was considerable overlap between these categories. For example, many of the women in at-risk racial/ethnic groups were of lower socioeconomic status and more likely to have limited access to medical care.

4.2.1. African Americans

African American women were the most common racial group in our search and were the focus demographic in ten

Table 1. Characteristics and summarized results of included studies.

Study	Design	Inclusion Criteria	Study Groups	Outcomes/ Results	Study Quality
Adams [28] (1997)	Retrospective cohort	Low risk white and black women in Georgia	Study group (black, n=4,885) Control (white, n=23,388)	Low birth weight, preterm birth / Low incidence of abnormal IPI and adverse outcomes in both cohorts. Interaction between race and IPI was not statistically significant	Level II-2
Akinbami [42] (2000)	Cross sectional	U.S. Natality files 1990-1996	Multiparas age 10-20 (n=899,393) 25 year old comparison group (n=440,462)	Preterm birth / Multiparous teenagers had an increased risk of PTB vs. comparison group (AOR 1.33-4.22)	Level II-3
Blackmore-Prince [37] (2000)	Secondary analysis of data from a case control study	Black women delivering at large, inter-city hospital in Georgia	IPI <3 mo (n=19), IPI >3 mo (n=475)	Birth weight / Infants born to women with an IPI >3 mo were 215 grams larger on average than those with a shorter IPI (p=0.06)	Level II-3
Cheslack-Postava [52] (2015)	Secondary analysis of data from a large interview study	Inclusion in database	N=10,236	Correlate intent to conceive with IPI / Majority of short interval pregnancies are unintended	Level II-3
Duncan [53] (1998)	Cross sectional	Utah residents with more than one birth	Study group (Medicaid recipients, n=5,002) Non-Medicaid recipients (16,844)	None measured / Utah Medicaid recipients were at greater risk for a shortened IPI and may benefit from family planning services	Level II-3
Dunlop [33] (2008)	Pilot study, mixed prospective/retrospective cohort	Indigent African-American women who delivered a very low birth weight (VLBW) infant	Intervention cohort (n=29) Retrospective cohort (n=58)	Number of pregnancies conceived following index VLBW pregnancy with composite of adverse obstetric outcomes / Women in the control cohort had on average 2.6x more pregnancies in an 18 mo interval compared to those in the intervention cohort (CI 1.1-5.8 vs 1.0-11.7)	Level II-2
Ekwo [38] (1998)	Retrospective cohort	Black and white women in hospital network with records available	Black women (n=293) White women (n=468)	Preterm birth / Risk of PTB with an IPI < 60 mo was not significant after adjusting for confounding variables (1.67, CI 0.42-2.91); on subgroup analysis, multiparous black women had a higher incidence of PTB	Level II-2
Fuentes-Afflick [29] (2000)	Retrospective cohort	White and Mexican-origin Hispanic women	N=289,842	Preterm birth / Women with extremes in IPI (<6 mo and >59 mo) were more likely to deliver preterm (AOR 1.31 and 1.18)	Level II-2
Gann [32] (1989)	Retrospective cohort	Cambodian refugees and white matched controls	Cambodian women (n=452) White women (n=110)	Preterm birth Stillbirth Birth weight Stillbirth / Cambodian refugees had a higher incidence of short IPI but this did not correlate with adverse obstetric outcomes	Level II-2
Gemmill [54] (2013)	Secondary analysis of survey data, modeling	2006-2010 National Survey of Family Growth	IPI <18 mo (n=789) IPI > 18 mo (n=1,465)	None measured / Reducing unintended pregnancies could decrease short IPI gestations from 35 to 23%	Level II-3

(Table 1). contd....

Study	Design	Inclusion Criteria	Study Groups	Outcomes/ Results	Study Quality
Gold [44] (2005)	Prediction modeling	WA state welfare recipients	N=20,028	None measured / Selected variables to predict shortened IPI were not useful in modeling (AUC=0.66)	Level II-3
Goyal [45] (2015)	Retrospective cohort with multivariable modeling	Medicaid population in Cincinnati OH	N=409 (263 derivation sample, 146 validation)	Preterm birth Birth weight Fetal demise Neonatal demise / Performance of model was modest in the prediction of outcomes (AUC=0.63)	Level II-2
Hogue [51] (2011)	Qualitative analysis of published studies	Six studies	N/A	Preterm birth / Optimizing IPI can reduce PTB by 8% in African Americans and 4% in Caucasians	Level II-3
James [35] (1999)	Retrospective cohort	Black and white women with term deliveries at a Boston hospital	Black women (n=578) White women (3,400)	Small for gestational age / Black women were more likely than white women to have a shortened IPI and an SGA infant though differences in IPI did not explain the SGA disparity	Level II-2
Kallan [31] (1997)	Retrospective cohort	US linked birth/infant death records	Black women (n=201,907) White women (843,486)	Preterm birth Small for gestational age Infant mortality / The impact of a short IPI on PTB and SGA was not different among racial groups (p>0.05)	Level II-2
Khoshnood [55] (1998)	Retrospective cohort	Data from National Center for Health Statistics	African-American (n= 610,839) Native American (n= 30,898) Mexican (n= 518,288) Non-Hispanic white (n= 3,643,947) Puerto Rican (n= 37,446)	Preterm birth Low birth weight / Women with an IPI <6 mo had a 50-80% increased chance of a VLBW infant and a 30-90% chance of a very PTB compared to those with intervals of >12 mo	Level II-2
Klebanoff [41] (1988)	Retrospective cohort	Data from the Collaborative Perinatal Project	N=5,938 (623 with IPI <3 mo, 5,315 IPI >3 mo)	Low birth weight / Infants born to the cohort of women with the shortest IPI had a 12% higher incidence of LBW	Level II-2
Klerman [40] (1998)	Records review	Hospital records system	N=4,400	Preterm birth / Percent of PTBs increased with declining IPI but only in women who had not had a previous PTB	Level II-3
Mburia-Mwalili [34] (2015)	Retrospective cohort	Nevada Birth Outcomes Monitoring System	N=124,341 (IPI <36 mo, n= 113,422; IPI > 35 mo, n=10,919)	Birth defects / Women with a long IPI (>36 mo) were more likely to have a fetus with a birth defect (AOR 1.16, CI 1.01-1.33)	Level II-2
Nabukera [30] (2009)	Retrospective cohort	Missouri linked cohort files	Black women (n=18,548) White women (n=221,382)	Fetal death Low birth weight Preterm birth / No significant racial differences were noted in IPI distribution after controlling for maternal age at first pregnancy	Level II-2

(Table 1). contd....

Study	Design	Inclusion Criteria	Study Groups	Outcomes/ Results	Study Quality
Partington [43] (2009)	Retrospective cohort	Milwaukee birth certificate data	N=111,862 (IPI < 18 mo, n=2,529; IPI > 19 mo, n=1,136)	Maternal weight gain Low birth weight Preterm birth / Women with an IPI <18 mo were more likely to have a PTB or LBW infant (1.6-2.9 and 1.4-2.3)	Level II-2
Rawlings [39] (1995)	Retrospective cohort	Delivery at a military medical center	Black women (n=298) White women (n=1,624)	Preterm birth Low birth weight / Black women with an IPI <9 mo were more likely to have a PTB and LBW infant (p= 0.02)	Level II-2
Shults [36] (1999)	Retrospective cohort	North Carolina birth certificate data	Black (n=5,890) and white (n=5,561) women with an IPI <24 months	Preterm birth Small for gestational age / Odds ratios for outcomes did not differ by race	Level II-2
Tucker [46] (2015)	Retrospective cohort with modeling	Pregnant women in North Carolina on Medicaid	N=15,428 (NHB, n=6,212)	Preterm birth / A short IPI (<12 mo) increased the risk for PTB in the NHB cohort	Level II-2

Abbreviations: AOR= adjusted odds ratio, AUC= area under the curve, CI= confidence interval, IPI= interpregnancy interval, LBW= low birth weight, mo= months, NHB= Non-Hispanic Black, PTB= preterm birth, SGA= small for gestational age, VLBW= very low birth weight

of the studies. In those that compared an African American cohort to another group, most reported an increased incidence of a shorter IPI though considerable variation was noted. In a secondary analysis of a hospital-based cohort study [35], James *et al.* reported that African American women were twice as likely to have an IPI less than six months than their white counterparts (p<0.001), though this group was also more likely to have lower education and less insurance coverage, and to be single and less than age 20 (all p<0.001). An analysis by Kallan [31] of 1991 US linked birth-infant death files also reported that African American women were twice as likely to have a shortened IPI (<7 months) than white women with disparities in education, age, and marital status from the white cohort that mirrored the James *et al.* study.

Other authors report more modest differences in short IPIs between black and non-black cohorts. Shults *et al.* [36] conclude that a shortened IPI is more common in women who are single, less educated, and have reduced access to

care and that these risk factors were similar between black and white cohorts in their study.

Few authors evaluated the incidence of a prolonged IPI in African American women, though a study by Adams *et al.* in 1997 [28] compared cohorts of low risk black and white women and reported that the former had a higher incidence of shortened (<3 months, 1.7 vs. 0.6 percent) and prolonged (>48 months, 24.8 vs. 16.8 percent) IPIs.

The impact of extremes in IPI on obstetric outcomes in the African American population is conflicting with the majority of studies reporting little or no significant difference in the effect, as compared with other populations. The Kallan study [31] described above reports comparable odds ratios for preterm birth (1.25 vs. 1.23) and small for gestational age infants (1.24 vs. 1.16) between the black and white cohorts (p>0.05). African American women with a prolonged IPI (defined as greater than 60 months) were actually less likely to deliver preterm (1.07 vs. 1.26) or have a low birth weight infant (1.14 vs. 1.31) compared to those in the white cohort (p<0.05).

In four other studies evaluating a shortened IPI in African American women [35-38], none reported a clinically significant difference in either preterm birth rate and/or infant weight after correcting for confounders. The study by James *et al.* [35] identified an increased frequency of low birth rates in the African American study population but the difference was unchanged after adjusting for the interpregnancy interval in logistic regression analysis, suggesting that the IPI did not mediate the relationship between race and adverse pregnancy outcome. The authors conclude that other factors contributed to this outcome difference.

While a retrospective cohort study by Ekwo and Moawad [38] comparing black and white women who conceived within three months of their prior pregnancy failed to dem-

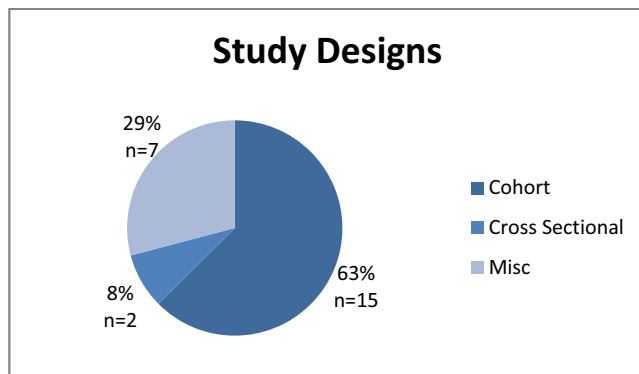


Fig. (2). Proportion and numbers of study designs of included publications.

onstrate a statistically significant difference, sub-group analysis identified an increased preterm birth rate in multiparous black women with a shortened IPI. The authors postulate that recurrent close interval pregnancies may lead to adverse outcomes through nutritional depletion, which may differentially occur between populations.

Two studies attempted to compare the impact of a shortened IPI in low-risk African American and Caucasian cohorts to reduce potential confounders. Rawlings and colleagues [39] analyzed data from 1,922 white and black low-risk women who had two consecutive, singleton gestations within a military health system that offered free access to obstetric care. Women in the African American cohort were more likely to be unmarried and have a lower household income though prenatal care after the first trimester was comparable between the two groups. The authors found an increased incidence of shortened IPIs, low birth weight, and preterm delivery among African American women. After logistic regression analysis, an interpregnancy interval less than three months was identified as a strong predictor of low birth weight and preterm birth in the white cohort; in contrast, less than six and nine months were predictive of adverse outcomes in the black cohort (all $p < 0.05$). The association between short IPI and adverse obstetric outcomes was more pronounced among African American women due in part to the higher frequency of shortened intervals and this finding persisted after excluding women with prior adverse obstetric outcomes.

In 1997, Adams *et al.* [28] performed a similar study in a non-military population. They reviewed medical records from 23,388 Caucasian women and 4,885 African American women in Georgia considered low risk for adverse obstetric outcomes. They defined low risk as a maternal age between 20-34, at least 12 years education, prenatal care starting in the first trimester, and having the father of the infant listed on the birth certificate. In contrast to Rawlings, they reported a low incidence of shortened IPI in both cohorts and the rate of adverse obstetric outcomes was also low. While offspring born to women with extremes in IPI were more likely to be born preterm and have reduced birth weight, an interaction between race and pregnancy interval was not statistically significant, suggesting that achieving an ideal IPI was unlikely to dramatically reduce the disparity in obstetric outcomes between the two groups.

4.2.2. Lower Socioeconomic Status

We identified four studies assessing short IPI in underserved populations with minimal effects on reported outcomes. No studies evaluated the effect of a prolonged IPI. Klerman and colleagues [40] reviewed the records of 4,400 women who received their prenatal care through a county health department clinic and delivered at the university or county hospital over a ten year period. Over 90 percent of women included in the study received federal aid and the majority initiated prenatal care in the second or third trimester. The study excluded women with no prenatal care. The authors found no clear association between pregnancy interval and low birth weight but noted that pregnancy intervals less than 13 weeks and 13-25 weeks was a strong predictor

of preterm birth (OR 1.9 (1.1-3.1) and 1.4 (1.01-1.9), respectively) after correcting for confounders.

Klebanoff [41] reviewed pregnancies from the Collaborative Perinatal Project – which includes prospectively collected data from 55,000 pregnancies – with the intent of exploring the relationship between birth weight, interpregnancy interval, and social and behavioral characteristics. He reports that younger, lighter weight, and less educated women were more likely to have a shortened IPI and that correcting for these factors reduced the association. For example, women with an IPI less than three months were 47 percent more likely to have a small for gestational age infant compared to women who delivered after an interval of 18-20.9 months. After adjusting for the above confounders, the risk was reduced by half. The author concludes that a shortened IPI exerts an effect through the baseline risk of the mother; however, it is difficult to discern whether maternal characteristics mediate or confound the relationship between IPI and outcome.

4.2.3. Adolescents

Two studies addressed the impact of short IPI in adolescent populations. Akinbami and colleagues compared multiparous teenagers to an adult cohort of women who were 25 years of age to assess the risk for preterm birth. Adolescents were more likely to have a shortened IPI - in part given the very nature of achieving multiparity in adolescence - but the adverse effects of this decreased interval appeared comparable between the two groups [42]. Partington and colleagues reviewed birth certificate data from 3,665 second pregnancies of Milwaukee teenagers. They identified a link between both low birth weight and preterm birth and an interpregnancy interval less than 18 months (OR 1.3-2.7) [43].

4.2.4. Additional Groups

Finally, we identified two studies that assessed the impact of extremes in IPI in focused populations. Fuentes and Hessol [29] evaluated the effect of interpregnancy interval and prematurity in a Mexican-origin Hispanic population versus a non-Hispanic white control group. The authors report that women with intervals of 18-59 months had the lowest risk for preterm birth with increased risk at both extremes. Hispanic women were more likely to have an extreme IPI and deliver preterm, and this finding persisted after correcting for confounders.

Gann and colleagues explored pregnancy outcomes in Cambodian refugees living in Massachusetts compared to white women [32]. While the authors noted that Cambodian women had more risk factors for adverse obstetric outcomes including IPIs less than or equal to six months (25.4 vs. 4 percent), major complications were actually less frequent than among the comparison group, perhaps secondary to other protective factors.

4.3. Impact of Interventions

Few studies assessed screening and/or interventions to improve outcomes associated with extremes in interpregnancy interval. Three studies used statistical modeling to identify individuals at increased risk. Gold *et al.* estimated the effects of individual and community-level variables on

pregnancy in recipients of government aid [44] in Washington State. Their analysis identified some differences in characteristics between women with different pregnancy intervals but they were unable to translate this into a high fidelity predictive model. Other studies with modeling in Medicaid populations that include IPI produced modest results at best [45, 46].

We identified only one study which employed an intervention to decrease the frequency of a short IPI and associated complications. Dunlop *et al.* enrolled African American women who delivered very low birth weight infants to receive coordinated health care and social support (including health and dental care, case management and group visits) for a total of 24 months and compared the number of pregnancies conceived during the study period to pregnancies conceived by a historical cohort. None of the women enrolled in the intervention cohort became pregnant within nine months of the index pregnancy compared to 31 percent of women in the control cohort ($p < 0.001$). The pregnancy rate in the intervention group also remained lower at 18 months ($p = 0.02$). The authors report a reduction in adverse obstetric outcomes in the intervention group, though the study was very small.

5. DISCUSSION

The intent of our literature review was to identify the frequency and impact of extremes in interpregnancy interval in populations traditionally affected by disparities in health and health care and thus at increased risk for adverse outcomes. We included 24 studies in the final analysis, 19 of which assessed pregnancy outcomes. With the exception of one study that included a pilot intervention, all were retrospective with considerable heterogeneity in definitions, inclusion criteria, and outcomes assessed, which prohibited a quantitative meta-analysis.

The results of our review suggest that at-risk populations may have increased frequencies of shortened IPIs though the impact appears to be moderate and inconsistent, with many studies demonstrating little to no effect on preterm delivery or birth weight after adjustment (odds ratios consistently less than 2.0). A few studies [31, 32] even reported improved select outcomes among women from underserved populations compared to other women. There was insufficient evidence to draw meaningful conclusions regarding a prolonged IPI or the effect of interventions.

Our review underscores the challenge of excluding the effects of measured and unmeasured confounding factors on the relationship between demographic predictors and pregnancy outcomes. Women in at-risk racial and ethnic populations, for example, were more likely to be on financial assistance, be single, and have limited prenatal care than white women in cohort studies. A study [39] attempting to assess the independent impact of black race on pregnancies complicated by extremes in IPI by selecting a low risk population still reported an increased frequency of baseline risk factors compared to the non-Hispanic white cohort.

We identified no studies that investigated biologic mechanisms that could explain potential adverse outcomes associated with extremes of IPI, specifically among popula-

tions otherwise at elevated risk. A short interval may lead to complications through the maternal depletion hypothesis [47, 48] as a result of nutritional deficiencies [49]; it is not unreasonable to conjecture that such deficiencies may have differential impacts in traditionally-underserved communities in which access to key micronutrients may be limited. Many studies included in this review did not measure or adjust for nutritional status, which may account for some of the observed heterogeneity in results. The pathophysiology underlying a prolonged IPI is less intuitive but may be due in part to a decline in physiologic adaptations from prior pregnancies over time leading to a virtual primigravid state [50]. Further research into these mechanisms, and into differential effects by population, could aid in the development of appropriate interventions.

The United States Healthy People 2020 initiative includes reducing the number of pregnancies conceived within 18 months of a prior birth as an objective. While our results suggest that the impact of increasing the rate of appropriately timed pregnancies in at-risk populations is likely to be modest, it may represent “low hanging fruit” given the higher baseline incidence of shortened IPIs and adverse outcomes in some of these populations. In addition, successful approaches to preterm birth reduction are likely to be incremental in nature and all modifiable risk factors should be considered targets for intervention. Indeed, a qualitative analysis of published studies [51] attributes eight percent of preterm births among African Americans to a shortened interpregnancy interval and suggests that reducing this number could lead to fewer preterm births and decrease the disparity in preterm births between racial groups. Focusing on multiparous patients with short IPIs may reflect an initial target demographic based on subgroup analysis from one study [38].

CONCLUSION

While the data are conflicting, extremes in interpregnancy interval appear to mildly increase the risk of complications in the general population. We hypothesized that women with a pre-existing increased risk for adverse obstetric outcomes – including racial and ethnic minorities and those of lower socioeconomic status – may be more susceptible to the effects of extremes in IPI and hence more likely to benefit from targeted interventions.

Our review of the literature confirms that women in at-risk populations are generally more likely to have a shortened IPI; however, most studies suggest that the effect on outcomes including preterm delivery and birth weight is modest (generally, odds ratios less than twice baseline) at best. There was insufficient evidence to draw meaningful conclusions about prolonged interpregnancy intervals or to make recommendations regarding interventions. Standardization of what constitutes a shortened and prolonged interpregnancy interval would facilitate comparison of outcomes across studies. Additional high quality research that accounts for confounding variables with prospectively collected data is needed. Finally, further investigation into the underlying mechanism of action may provide more insight into the effects of extremes in IPI and better direct interventions.

Despite a modest effect size, efforts to achieve an appropriate interpregnancy interval in at-risk populations may be worthwhile given the increased baseline incidence of complications.

DISCLAIMER

Several of the authors are active duty military service members. The views expressed in this article are those of the author(s) and do not necessarily reflect the official policy or position of the Department of the Air Force, Department of the Army, Department of Defense, or the United States Government.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

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