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Nutrition of Black Women During Pregnancy

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Abstract

Objective—To examine the consistency and adequacy of nutritional intake in a population of Black women in the second and third trimesters of pregnancy.

Design—This was a longitudinal descriptive study. Data were collected from women with low-risk pregnancies at 22–24 week prenatal visits and two subsequent visits.

Setting—Participants were recruited from urban prenatal clinics in one city in the Northeastern United States.

Participants—Pregnant women who self-identified as Black ($N=195$)

Methods—A 24-hour diet recall was obtained at each of the three study time points. Food models and measuring cups were used to improve the accuracy of portion size reporting. Data from diet recalls were manually entered in Food Processor software to compute nutritional content.

Results—Dietary intake was examined using a linear mixed effect model. Dietary patterns were stable from the second to the third trimester and caloric intake was inadequate. Women met minimal daily requirements for carbohydrate and protein intake, but the overall percentages of fat, protein, and carbohydrates indicated that additional calories needed to come from protein.

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Précis: Given the stability and overall inadequacy of pregnant Black women's diets, nutritional counseling should be considered at any point in the second and third trimesters.

Although more than 80% of women regularly took prenatal vitamins, micronutrient and fiber intake were consistently inadequate.

Conclusion—Prenatal care that helps women to identify foods that are high in fiber, protein, and micronutrients is important for the health of the women and newborns. Knowing that nutritional intake is consistently inadequate, whenever nurses are in contact with pregnant women counseling can occur in attempt to improve nutritional intake and make women aware of inexpensive nutrient sources.

Keywords

pregnancy; maternal nutrition; black women; nutritional requirements; prenatal nutritional physiology; pregnancy trimester; second; pregnancy trimester; third

Proper maternal nutritional status before and during pregnancy is known to improve birth outcomes and overall welfare of the neonate. Nutrient deficiencies during pregnancy can have significant implications for maternal and neonatal outcomes, including preterm birth, low birth weight, birth defects, maternal anemia, and neural tube defects (Abu-Saad & Fraser, 2010; De Jersey, Ross, Himstedt, McIntyre, & Callaway, 2011; Peña-Rosas, De Regil, Dowswell, & Viteri, 2012). Despite the importance of good nutrition, more than half of all pregnant women do not follow recommendations for healthy eating early in pregnancy (Fowles, 2002; Diemert et al., 2016; O'Neill et al., 2011). The likelihood of having a diet that meets established nutritional recommendations is dependent on a variety of factors, including economic status; psychological factors, such as perceived self-efficacy, education, age, and ethnic preferences; and physical factors, such as nausea (Crozier et al., 2009; Inskip et al., 2014; Paul, Graham, & Olson, 2013; Rifas-Shiman, Rich-Edwards, Kleinman, Oken, & Gillman, 2009).

Callout 1

There has been little research to exclusively examine the diets of Black women, and the Institute of Medicine has called for more research in this area so that improved, culturally appropriate care can be provided (Rasmussen & Yaktine, 2009). In one study of Black women in the third trimester, participants tended to have higher caloric diets with excessive fats, carbohydrates, and sugar that lacked important nutrients such as folate and fiber. The researchers did not test for consistency of this pattern earlier in pregnancy (Gennaro, Biesecker, Fantasia, Nguyen, & Garry, 2011). Brooten and colleagues (2012) examined diet in the first 20 weeks of pregnancy and found African American women consumed higher calorie diets than other racial groups, but they only examined diet at one time point. Although weight alone is not a measure of adequate nutrition, pregnant African American, Black, and Caribbean Black women have also been shown to have higher rates of obesity than other racial groups, which provides another rationale to examine nutrition in these women (Brooten et al., 2012).

Some researchers who examined nutrition during pregnancy only analyzed one time point (Siega-Riz, Bodnar, & Savitz, 2002; Webb, Siega-Riz, & Dole, 2009), but diet quality continues to be important throughout pregnancy. Maternal diets may change from the second

to third trimester because of the physiological changes of pregnancy that affect appetite, such as the space in the abdomen occupied by the fetus. Additionally, nutrient needs change in the third trimester, including increased calcium and caloric requirements, and nutrient intake needs to support the rapid fetal weight gain and increased maternal basal metabolic rate during this time (Butte, Wong, Treuth, Ellis, & Smith, 2004; Kovacs, 2001).

Rifas-Shiman et al. (2006) examined dietary changes between trimesters in a group of predominantly non-minority pregnant women ($N=1543$, 25% self-identified as racial minorities). The overall mean of food and nutrients consumed from foods did not change significantly from the first to second trimester; intake of only skim or 1% dairy foods, whole-fat dairy foods, red and processed meat, saturated fat, and vitamin D increased by at least 5% between the first and second trimester. Adequacy of nutrient intake was not addressed. Further research is needed to determine if minority women have similar patterns of nutritional intake as majority women. Minority women are at increased risk of obstetrical complications that might be influenced by nutrition (such as preeclampsia) and are also at increased risk for nutritional imbalances such as over nutrition and obesity (Knuist, Bonsel, Zondervan, & Treffers, 1998; Mehta, 2008).

The purpose of our study, therefore, was to examine the nutritional intake of a population of Black women over three time points in the second and third trimester and to determine the consistency and adequacy of nutrient intake throughout pregnancy amongst this minority population. The research questions were as follows: What is the adequacy of nutrition intake at three time points: 22–24 weeks gestation, 26–28 weeks of gestation, and 30–34 weeks of gestation? Does the adequacy of nutritional intake change over time?

Literature Review

Much of the available literature on nutrition during pregnancy focuses on assessing weight or overall caloric intake rather than on specific nutrient intake. Adequate caloric intake prevents compromised fetal growth that has been linked to numerous poor outcomes later in life, including type II diabetes, hypertension, and cardiovascular disease (Barker, Osmond, Golding, Kuh & Wadsworth, 1989; Calkins & Devaskar, 2011; Phipps et al., 1993; Zhang, Kris-Etherton, & Hartman, 2013). Adequacy of nutritional intake cannot be determined simply by weight change or even on weight and caloric intake. Researchers found energy intake to actually be inversely related to overall diet quality, with lower-energy diets associated with consumption of a relatively higher proportion of micronutrients and water (Ledikwe et al., 2006; Andrieu, Darmon, & Drewnowski, 2006). Therefore, women may gain sufficient or even excess weight with a high-energy diet but still lack vital nutrients; this suggests a need to study which foods are actually consumed during pregnancy.

Having a balanced macronutrient intake, including sufficient protein and fiber intake and avoiding excessive intake of fats or carbohydrates, can have a large effect on a woman's health during pregnancy. Having a protein intake of at least 71 grams per day increases the likelihood of an appropriate birth weight (Godfrey, Robinson, Barker, Osmond, & Cox, 1996; Institute of Medicine, 2005). Women should also consume adequate fiber, defined as at least 28 grams per day. There are multiple positive effects of sufficient fiber intake,

including minimizing or alleviating constipation that often occurs in pregnancy and decreasing late gestational weight gain and postpartum weight retention (Institute of Medicine, 2005; Kaiser, Allen & American Dietetic Association, 2008; Drehmer et al 2012; Brooten et al., 2012; Maple-Brown et al, 2013). Not only the amount, but also the quality of carbohydrates consumed must be considered, as a diet with too low a glycemic index has been associated with an increased risk for small for gestational age infants (Scholl, Chen, Khoo, & Lenders, 2004).

Adequate consumption of micronutrients is protective against various complications of pregnancy. Currently, it is recommended that pregnant women obtain 1200–2500 mg/d of calcium and 600–1000 µg/d of folate (Institute of Medicine, 2005). Calcium supplementation and appropriate folate intake have protective effects against preeclampsia (Hofmeyr, Lawrie, Atallah, Duley, & Torloni, 2014; Endeshaw, Ambaw, Aragaw, & Ayalew, 2014). Previous research findings have linked the consumption of certain micronutrients to positive health outcomes. For example calcium intake is associated with the bone health of both mother and fetus, while folate consumption is associated with neural tube defects (Thomas & Weisman, 2006; De Jersey et al., 2011). Vitamin D, which is necessary for calcium absorption, is also essential for bone health. It is recommended that pregnant women consume 15–100 µg/d (Institute of Medicine, 2005). Iron also has numerous benefits, preventing low birth weight as well as maternal anemia, which in turn has been linked to preeclampsia development (Peña Rosas et al., 2012; Endeshaw et al., 2014). Pregnant women should obtain 27 to 45 mg/d of iron (Institute of Medicine, 2005).

The multitude of micronutrients found in fruits and vegetables are essential for healthier pregnancy outcomes as well. Vitamin C, found in high amounts in many fruits and vegetables, was positively correlated with placental weight (Mathews, Yudkin, & Neil, 1999). Researchers have also found a correlation between increased vitamin C, fruit, and vegetable consumption and decreased occurrence of small for gestational age newborns (Rao et al., 2001; Mikkelsen, Osler, Orozova-Bekkevold, Knudsen, & Olsen, 2006; Jain, Wise, Yanamandra, Dhanireddy, & Bocchini, 2007; Ramon et al., 2009). Endeshaw and colleagues (2014) also found increased vegetable and fruit consumption to be protective against preeclampsia. Many women do not adequately eat fruits and vegetables despite the known benefits (Crozier et al., 2009; Krebs-Smith, Guenther, Subar, Kirkpatrick, & Dodd, 2010; Stallings, Gazmararian, Goodman, & Kleinbaum, 2015).

Younger women and women with lower educational status were less likely to follow public health recommendations for pregnancy, including nutritional recommendations (Crozier et al., 2009). Black women had higher overall intake of calories in the first 20 weeks of pregnancy compared to white non-Hispanic women, as well as higher intakes of protein, total fats, carbohydrates, sugar, and dietary iron (Brooten et al., 2012). It is important to know if these patterns are stable over time so that nurses have adequate information upon which to determine when and how to intervene to improve the nutritional intake of pregnant minority women.

Methods

Black women (n=195) from one city in the Northeast receiving prenatal care were eligible to participate in this study. The study participants provided nutritional data during the second and third trimesters of pregnancy so that stability of nutritional intake could be examined. Data for this analysis were collected as part of a larger NIH-funded (R01NR 0552) study that examined physiologic mechanisms underlying preterm labor in minority women. The framework of the parent study was based on the physiology of stress and labor initiation. The sample of this study was derived from the control group (healthy pregnant women) of the larger research study supported by the NIH grant to Boston College (NR010552). In the parent study, women provided cervical and serum specimens and completed paper and pencil questionnaires on stress and other constructs as well as provided nutritional intake information.

Sample

Participants in our study were recruited during standard office hours at prenatal clinics in three urban city hospitals in the Northeastern United States. Women were eligible to participate if they were 18 years or older, between 22–24 weeks gestational age with a singleton pregnancy, spoke English or Spanish, and had no known chronic medical ailments, such as heart disease, kidney disease, chronic hypertension, auto-immune disease, or asthma requiring steroid use. Furthermore, to be eligible women needed to be experiencing uncomplicated pregnancies (i.e. free from obstetrical complications such as cervical, uterine, or congenital fetal anomalies, preeclampsia, placenta previa, or gestational diabetes). If chart review indicated that a woman met inclusion criteria, the study coordinator approached the potential participant to determine if she self-identified as Black and was interested in participating in the study. Approximately 58% of women who were screened and met study criteria agreed to participate in the study. Those refusing most often cited lack of time or disinterest in providing additional physiologic specimens, as required by the parent study, as the reason for not participating. The Institutional Review Board at the respective recruitment sites approved our study, and all willing participants signed informed consent.

A post-hoc power analysis was run to assess adequacy of the sample size and to measure the probability that the linear mixed effect model would accurately reject the null hypothesis that nutrition does not change over time. The power obtained, $1 - \beta = 0.949$ (with an effect size of 0.2 and 3 repeated time point measures) indicated that the power of this test was sufficient.

Procedure

Women who consented to participate provided nutritional data for one 24 hour period at each of three time points: 22–24 weeks, 26–28 weeks and 30–32 weeks gestation. Demographic information was collected at the first visit and diet recalls were performed for the 24 hour period immediately prior to the three prenatal study visits. Diet recalls were conducted in person with the assistance of the Research Coordinator. All participants described each meal and snack consumed throughout the day including beverages and specified timing of consumption. The Research Coordinator used food models, measuring

cups and images of various foods and portions sizes to ensure accuracy in quantifying the amount of food and beverages consumed. The Research Coordinator encouraged participants to include brand names when possible so nutritional value could be more accurately assessed.

Diet recalls collected for the 24 hours leading up to the patient visit ensured that both weekday and weekend eating habits were captured for a more comprehensive dataset of nutrient intake. In previous work supported by an NINR grant to New York University (R03NR008548-01), these techniques proved effective when collecting nutritional data in pregnant women from similar environments. Participants were compensated for their involvement upon completion of each study visit.

Data from the diet recalls were entered into a computerized database called Food Processor Diet Analysis and Fitness Software (ESHA Research, 1981). The Food Processor database contains over 55,000 food items, including fast food and franchise items, and reports on 163 nutritional components as dictated by the USDA and over 1,800 research sources (ESHA, 2015).

Results

The average age of women in this study was 26 ($SD=6.1$) with women ranging in age from 18 to 43 years old (Table 1). A majority of the women were single (74.9%, $n=146$) and reported the United States as their country of birth (62.6%, $n=122$). Although 47.7% ($n=93$) of the women surveyed were employed during this pregnancy, more than half of the study participants (58.4%, $n=115$) had an annual source of income or support of less than \$5,000. While the average body mass index (BMI) of the women was 29.9 ($SD=7.2$), the majority of women in this study (43.1%, $n=84$, $SD=5.6$) had a BMI of 30 or greater, placing them in the obese category. An additional 27.2% ($n=53$, $SD=1.3$) of the women had a BMI between 25 to 30, placing them in the overweight category.

Data from all three time points, which was used to examine change over time, were available from 158 women (81%). Thirty-seven women missed a prenatal visit at one of the scheduled time points. Of the total women enrolled in the study ($n=195$), 194 (99%) completed the diet recall survey at the prenatal visit occurring between 22–24 weeks gestation, 170 (87%) at the visit occurring between 26–28 weeks gestation, and 166 (85%) at the prenatal visit occurring between 32 and 34 weeks of gestation.

CALLOUT 2

Analysis Over Time—To assess whether the change in nutrition was significant over time, a linear mixed effect model was used. The nutrient of interest was selected as the dependent variable with the predictor of time point modeled as a fixed effect. Because of the repeated measures, subject-specific effects were modeled as random effects to control for variation. The results of this analysis demonstrated that nutrient intake over time did not differ significantly demonstrating p-values equal or greater to 0.05 for all of the macro or micronutrients in this group of pregnant women (Table 2) indicating that overall nutritional intake within these groups of women was consistent across the second and third trimesters.

Additionally, we conducted a chi-square analysis to assess whether there was individual variation in any of the nutrient categories across the study time points. This analysis examined the difference in nutrition using the categories “under” and “met,” and, where applicable “over.” Results of the chi-square test were non-significant at the P value of 0.05 (Table 2) demonstrating that the nutritional intake was stable from the second to the third trimester.

Caloric Intake—At the first time point, which occurred during the second trimester between 22 to 24 weeks of gestation, the majority of women (55.7%, $n=108$, $SD=398$) consumed below the recommended guidelines for daily caloric intake during pregnancy. An additional 22.7% ($n=44$, $SD=692$) of the women ate above the guidelines bringing the total number of women who ate outside the recommended guidelines to 78.4% ($n=152$). Only a small fraction of women (26.1%, $n=42$, $SD=158$) ate within the recommended guidelines for daily caloric intake. A similar trend continued across the trimesters, with only a small portion of women meeting the recommended caloric intake throughout their pregnancies (Table 3). Although the percentage of women who ate below or above the daily recommendations for caloric intake fluctuated across the time points, the change was not significant.

Macronutrients—During 22 to 24 weeks gestation, the majority of women (59.3%, $n=115$, $SD=27.3$) consumed above the recommended minimum grams for protein (Table 4), while a modest 40.7% ($n=79$, $SD=14.7$) of the women consumed below the recommended guidelines for protein intake in grams. Similarly, most women (78.4%, $n=152$, $SD=119.3$) at 22 to 24 weeks gestation had consumed above the minimum recommended guidelines for daily carbohydrate intake in grams, with only 21.6% ($n=42$, $SD=43.1$) falling below the guidelines for carbohydrate intake. This trend continued throughout the remainder of the pregnancies with the majority of women eating enough grams of protein and carbohydrates to meet the minimum recommendations.

There are no current recommended guidelines for fat intake in grams. For this reason, the proportions of protein, carbohydrates, and fat that made up the pregnant women’s diets were evaluated. Overall, 43.8% ($n=85$, $SD=2.8$) of the women reported consuming an appropriate amount of fats as part of their diets at 22 to 24 weeks gestation (Table 4). Only 21.1% ($n=41$, $SD=5.4$) of the women had a diet that consisted of a higher percentage of fat intake above the recommended proportion, compared to 35.1% ($n=68$, $SD=5.4$) of the women whose fat intake as a proportion of their diet was deficient and below recommended guidelines.

Similarly, most women (47.9%, $n=93$, $SD=4.2$) met the recommended guidelines at 22 to 24 weeks gestation for proportion of carbohydrate intake as part of their diets (Table 4). However, a much lower 8.3% ($n=16$, $SD=7.0$) of women reported diets that were deficient in proportion of carbohydrates and below the recommended guidelines. A notable number of women (43.8%, $n=85$, $SD=6.8$) consumed diets at 22 to 24 weeks gestation in which carbohydrate intake as a proportion of the diet was above the recommended guidelines.

While most women were able to consume the minimum amount of recommended grams of protein (Table 4) at 22 to 24 weeks gestation, for 67.0% ($n=130$, $SD=3.3$) of the women, the

proportion of the their diets that was made up of protein fell below the recommended guidelines. Only 24.2% ($n=47$, $SD=1.5$) of the women ate a diet consisting of an adequate proportion of protein, while an additional 8.8% ($n=17$, $SD=7.3$) ate a diet that was proportionally greater in protein. In summary, during the second trimester, the proportion of the women's diets that was predominantly deficient in protein as a percentage of diet and leaned toward greater carbohydrate and fat intake. This trend continued throughout the remainder of the pregnancies.

Micronutrients—At 22 to 24 weeks gestation, the number of pregnant women who did not consume adequate amounts of vitamin D (Table 5) was significant at 96.4% ($n=187$, $SD=3.1$). No women consumed greater than the recommended upper tolerable limits of vitamin D intake during this time period. This resulted in only 3.6% ($n=7$, $SD=9.7$) of women who consumed vitamin D within the recommended ranges.

Similarly, most women (66.5%, $n=129$, $SD=136.5$) did not consume the minimum required amount of folate per day between 22 to 24 weeks of gestation (Table 5). Only 24.7% ($n=48$, $SD=96.4$) of the women consumed within the recommended amount of folate while an additional 8.8% ($n=17$, $SD=655.6$) consumed above the tolerable upper limit of folate. In total, 75.3% of the women ($n=146$) consumed folate levels outside the recommended limits during the second trimester.

As with the other micronutrients reported, the majority or 63.4% ($n=123$, $SD=5.6$) of the women did not meet the minimum recommended guidelines for dietary iron intake at 22 to 24 weeks of gestation (Table 5). Only 56 women (28.9%, $SD=4.4$) were able to consume daily iron amounts that were within the recommendations. Another 7.7% ($n=15$, $SD=38.5$) of the women consumed above the tolerable limits for daily iron intake bringing the total percentage of women who consumed outside the tolerable recommended intake for iron to 71.1% ($n=138$).

At 22 to 24 weeks gestation, over half of the pregnant women (54.6%, $n=106$, $SD=204.3$) did not consume the recommended amount of calcium in their diets (Table 5). While less than half the women (43.5%, $n=85$, $SD=326.8$) fell within the recommended guidelines, very few women (1.6%, $n=3$, $SD=2,080.4$) exceeded the tolerable upper limits. In total, 56.2% ($n=109$) of the women consumed calcium in amounts outside the recommended tolerable limits.

In summary, a minority of women consumed appropriate levels for the all studied micronutrients, including vitamin D, folate, iron, and calcium within recommended tolerable limits over time. This deficiency in consumption remained consistent from second to third trimesters despite regular and consistent prenatal vitamin use by 81.67% of the women.

Fruits, Vegetables, and Fiber—During 22 to 24 weeks gestation, a large majority of women (96.9%, $n=188$, $SD=1.7$) failed to consume adequate amounts of fruits and vegetables. The majority of women similarly consumed inadequate fruits and vegetables at both time point two (99.4%, $n=169$, $SD=1.7$) and time point three (97.6%, $n=162$, $SD=1.5$). Not surprisingly, the vast majority of the women (93.3%, $n=181$, $SD=6.2$) also fell below the

recommended daily guidance for fiber intake with only 6.7% ($n=13$, $SD=8.7$) of women eating enough fiber in their pregnancy diets. This trend continued throughout the pregnancy, with the majority of women consuming fiber below the recommended amounts at both time point two (91.8%, $n=156$, $SD=6.1$) and time point three (89.2%, $n=148$, $SD=7.0$).

Discussion

Our findings suggested that women's diets largely do not vary across the second and third trimesters of pregnancy and remain inadequate across these weeks (Table 6). Rifas-Shiman and colleagues (2006) similarly found a pattern of consistent nutrient intake across the first and second trimester for a sample of both majority and minority women, and our study extends those findings by demonstrating that these patterns are stable into the third trimester. Continued assessment and dietary intervention are therefore vital even throughout the latter half of pregnancy, as it is likely that at any point in these weeks women's diet will be insufficient in multiple nutrients.

CALLOUT 3

Overall micronutrient intake was not sufficient for those surveyed, despite prenatal vitamin use. Gennaro and colleagues (2011) similarly found Black women to be consuming inadequate micronutrients, including iron, vitamin D, and calcium, during the third trimester, but did not look to the second trimester to see if this was a consistent trend. Prenatal vitamins were not enough to completely supplement the lack of micronutrients consumed from food sources for the women in our study. Women should be instructed at their prenatal visits that prenatal vitamins do not replace consuming a healthy diet rich in micronutrients.

Knowing that both micronutrient and fiber intake were largely below recommended levels, fruit and vegetable intake should also be closely examined. Over 90% of women were below fruit and vegetable recommendations at all three time points, consistent with the inadequate intake of fruits and vegetables in the United States among the general population (Stallings et al., 2015). Providers should identify the barriers to fruit and vegetable consumption while counseling patients, including taste, cost, cultural preference or habit, availability, access to transportation, quality of available choices, variety of choices, and time for preparation (Haynes-Maslow, Parsons, Wheeler, & Leone, 2013). Food assistance programs can also be helpful to encourage women to consume more fruits and vegetables in pregnancy.

Among our participants, carbohydrates and fats were two of the only nutrients for which women did not fall below guidelines. Pastas and rice are often inexpensive and filling foods, which may be the reason for the excessive carbohydrate intake we found. Cultural sensitivity is imperative for counseling pregnant women regarding choices of carbohydrates that are also rich in other nutrients. For example, our participants commonly ate refined white rice. Recommending a simple swap of whole grain brown rice in place of white rice could increase their intake of micronutrients and fiber. The majority of women ate an appropriate amount of fats, but counseling should be provided to ensure choices are made for healthier fat options.

Surprisingly, the greatest portion of the women studied actually fell below recommended limits for daily caloric intake, despite findings in previous studies that found Black women tend to consume more calories than women of other races (Siega-Riz, Bodner, & Savitz, 2002; Brooten et al., 2011). Women should be coached on the importance of consuming adequate calories to support fetal growth, as low birthweight has been associated with numerous short term consequences, including neonatal death, hypoglycemia, and necrotizing enterocolitis, as well as long-term consequences including coronary heart disease and type II diabetes (Lubchenco & Bard, 1971; Bernstein, Horbar, Badger, Ohlsson, & Golan, 2000; Barker, Eriksson, Forsen, & Osmond, 2002; Harris, Weston, & Harding, 2012). The deficiency in caloric intake for our study participants can most likely be attributed to lower protein intake. When studying overall diet composition, the percentage of total calories consumed from protein was lower than recommendations, despite adequate consumption in terms of grams. This may be linked to the cost of many protein rich foods, which should be considered by practitioners when providing prenatal nutrition counseling.

Interestingly, our findings regarding protein and caloric intake stand in contrast to the findings of a study of multiple ethnic groups by Brooten and colleagues (2011), who found African American women consumed higher calorie, higher protein diets than members of other racial groups. Of note, though, is the fact that Brooten et al. (2011) separated African Americans and Caribbean Black women into two distinct groups, and that Caribbean Black women did not consume excess calories and had lower protein and iron intake, similar to the women in our study. Caribbean Black women also had similar iron and fruit and vegetable intake to the women in our study and could have benefited from prenatal nutritional counseling on these nutrients.

Limitations

Limitations to our study included the possibility of selection bias, which might exist with women who agreed to participate differing from those who declined. Those surveyed as part of our study were recruited from one urban area in the Northeast United States. It is unknown whether similar results would also be reported in Black women from more diverse settings.

Prepregnant weight was also not obtained for the study participants. Therefore, another limitation is that without prepregnant BMI we could not examine guidelines for overall weight gain during pregnancy and assess for the caloric intake that would be necessary to ensure appropriate weight gain. Another potential limitation of our study is self-reporting of nutrient intake may be unreliable because women underreport food consumption (Gemming, Jiang, Swinburn, Utter, & Mhurchu, 2014). However, we used food models, measuring cups, empty containers, and other prompts to ensure as accurate as possible reporting of intake.

Implications for Future Research and Practice

Our findings demonstrated a large gap between the nutritional intake of Black women and recommendations. Because diets were consistently inadequate, nutritional counseling provided by nurses at any point of contact prenatally could help to address this issue. Based

on our findings, one area of focus when providing such counseling should be protein consumption. Women's economic resources and cultural food choices should be considered in coaching women to consume more calories from protein sources. More economical protein options should be suggested, such as eggs and plant-based proteins. Plant-based proteins can additionally provide folate, potassium, and magnesium, as well as fiber, which was also lacking in our participants. Providers should also consider culturally appropriate food choices. For our participants, this would include choices such as kidney beans and goat meat.

Nurses should also better encourage fruit and vegetable consumption, again keeping cost as well as access in mind. Lower-cost options can be recommended such as frozen, dried, or 100% juices without added sugar (Chen, Liu, & Binkley, 2012; Haynes-Maslow, 2013). Women should be advised to consume seasonal vegetables, buy in bulk for products with longer shelf lives, and seek farmer's markets where available, which can often be less expensive than grocery stores. Canned vegetables are often the most cost-effective option, however, they can be less nutrient-dense and have higher levels of sodium than fresh or frozen varieties.

Further research is needed to examine the preconceptional diets of women who did not consume sufficient fruits, vegetables, and protein during pregnancy to determine whether this is an issue related to the physiologic changes of pregnancy or if diets were similarly lacking in nutrients before conception. If diets were similarly deficient before pregnancy, preconception nutrition programs may be helpful.

Additional studies are needed to test interventions targeted at improving nutrition in minority women. Specifically, programs that improve fruit, vegetable, protein, and micronutrient intake during pregnancy would have been helpful for our participants. Programs that are currently available seem to be insufficient, as the women in this study failed to consume adequate nutrients despite the availability of WIC and nutritionists. Preconception or antepartum programs may also be helpful in improving the overall nutrition of minority women.

Conclusion

The prenatal period is an important time for nurses to help pregnant women learn about how best to select nutritious, cost effective, and culturally appropriate food choices. Our research findings showed consistently inadequate nutrient intake across the second and third trimesters, supporting that nutritional counseling delivered at any point of contact during this time can be helpful to patients. Pregnant women are interested in nutrition as well as weight gain, and health promotion during this time period is beneficial to both mothers and their infants. Nurses play a vital role in working with women on nutritional choices throughout prenatal care.

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References

- Abu-Saad K, Fraser D. Maternal nutrition and birth outcomes. *Epidemiologic Reviews*. 2010; 32(1):5–25. <https://doi.org/10.1093/epirev/mxq001>. [PubMed: 20237078]
- Andrieu E, Darmon N, Drewnowski A. Low-cost diets: more energy, fewer nutrients. *European Journal of Clinical Nutrition*. 2006; 60(3):434–436. DOI: 10.1038/sj.ejcn.1602331 [PubMed: 16306928]
- Barker D, Osmond C, Golding J, Kuh D, Wadsworth ME. Growth in utero, blood pressure in childhood and adult life, and mortality from cardiovascular disease. *British Medical Journal*. 1989; 298(6673):564–567. <http://dx.doi.org/10.1136/bmj.298.6673.564>. [PubMed: 2495113]
- Bernstein IM, Horbar JD, Badger GJ, Ohlsson A, Golan A. Morbidity and mortality among very-low-birth-weight neonates with intrauterine growth restriction. *American Journal of Obstetrics and Gynecology*. 2000; 182(1):198–206. [http://dx.doi.org/10.1016/S0002-9378\(00\)70513-8](http://dx.doi.org/10.1016/S0002-9378(00)70513-8). [PubMed: 10649179]
- Brooten D, Youngblut JM, Golembeski S, Magnus MH, Hannan J. Perceived weight gain, risk, and nutrition in pregnancy in five racial groups. *Journal of the American Academy of Nurse Practitioners*. 2012; 24(1):32–42. DOI: 10.1111/j.1745-7599.2011.00678.x [PubMed: 22243679]
- Butte NF, Wong WW, Treuth MS, Ellis KJ, Smith EOB. Energy requirements during pregnancy based on total energy expenditure and energy deposition. *The American Journal of Clinical Nutrition*. 2004; 79(6):1078–1087. [PubMed: 15159239]
- Calkins K, Devaskar SU. Fetal origins of adult disease. *Current Problems in Pediatric and Adolescent Health Care*. 2011; 41(6):158–176. <http://dx.doi.org/10.1016/j.cppeds.2011.01.001>. [PubMed: 21684471]
- Chen SE, Liu J, Binkley JK. An exploration of the relationship between income and eating behavior. *Agricultural and Resource Economics Review*. 2012; 41(1):82–91.
- Crozier SR, Robinson SM, Borland SE, Godfrey KM, Cooper C, Inskip HM. Do women change their health behaviours in pregnancy? Findings from the Southampton Women's Survey. *Paediatric and Perinatal Epidemiology*. 2009; 23(5):446–453. DOI: 10.1111/j.1365-3016.2009.01036.x. [PubMed: 19689495]
- De Jersey SJ, Ross LJ, Himstedt K, McIntyre HD, Callaway LK. Weight gain and nutritional intake in obese pregnant women: Some clues for intervention. *Nutrition & Dietetics*. 2011; 68(1):53–59. DOI: 10.1111/j.1747-0080.2010.01470.x
- Diemert A, Lezius S, Pagenkemper M, Hansen G, Drozdowska A, Hecher K, Zyriax BC. Maternal nutrition, inadequate gestational weight gain and birth weight: results from a prospective birth cohort. *BMC Pregnancy and Childbirth*. 2016; 16(1):224–232. DOI: 10.1186/s12884-016-1012-y [PubMed: 27528213]
- Drehmer M, Camey SA, Nunes MA, Duncan BB, Lacerda M, Pinheiro AP, Schmidt MI. Fibre intake and evolution of BMI: from pre-pregnancy to postpartum. *Public Health Nutrition*. 2012; 16(08):1403–1413. DOI: 10.1017/S13689800012003849 [PubMed: 22916703]
- Endeshaw M, Ambaw F, Aragaw A, Ayalew A. Effect of maternal nutrition and dietary habits on preeclampsia: a case-control study. *International Journal of Clinical Medicine*. 2014; 5(21):1405–1415. DOI: 10.4236/ijcm.2014.521179
- Research ESHA. Food Processor SQL nutrition and fitness software. 1981. [Accessed 2008–2014]. <http://www.esha.com>
- Research ESHA. Food Nutrition Database. 2015. Electronically retrieved from <http://www.esha.com/nutritional-database/>
- Fowles ER. Comparing pregnant women's nutritional knowledge to their actual dietary intake. *MCN: The American Journal of Maternal/Child Nursing*. 2002; 27(3):171–177.
- Gemming L, Jiang Y, Swinburn B, Utter J, Mhurchu CN. Under-reporting remains a key limitation of self-reported dietary intake: an analysis of the 2008/09 New Zealand Adult Nutrition Survey. *European Journal of Clinical Nutrition*. 2014; 68(2):259–264. DOI: 10.1038/ejcn.2013.242 [PubMed: 24300904]
- Gennaro S, Biesecker B, Fantasia HC, Nguyen M, Garry D. Nutrition profiles of American women in the third trimester. *MCN: The American Journal of Maternal/Child Nursing*. 2011; 36(2):120–126. DOI: 10.1097/NMC.0b013e3182057a13

- Godfrey K, Robinson S, Barker DJP, Osmond C, Cox V. Maternal nutrition in early and late pregnancy in relation to placental and fetal growth. *British Medical Journal*. 1996; 312(7028):410–414. <http://dx.doi.org/10.1136/bmj.312.7028.410>. [PubMed: 8601112]
- Harris DL, Weston PJ, Harding JE. Incidence of neonatal hypoglycemia in babies identified as at risk. *The Journal of Pediatrics*. 2012; 161(5):787–791. <http://dx.doi.org/10.1016/j.jpeds.2012.05.022>. [PubMed: 22727868]
- Haynes-Maslow L, Parsons SE, Wheeler SB, Leone LA. A qualitative study of perceived barriers to fruit and vegetable consumption among low-income populations, North Carolina, 2011. *Preventing Chronic Disease*. 2013; 10:E34. <http://dx.doi.org/10.5888/pcd10.120206>. [PubMed: 23489639]
- Hofmeyr GJ, Lawrie TA, Atallah AN, Duley L, Torloni MR. Calcium supplementation during pregnancy for preventing hypertensive disorders and related problems (review). *Cochrane Database of Systematic Reviews*. 2014; 6:CD001059.doi: 10.1002/14651858.CD001059.pub4
- Inskip H, Baird J, Barker M, Briley AL, D'angelo S, Grote V, Chrousos GP. Influences on adherence to diet and physical activity recommendations in women and children: insights from six European studies. *Annals of Nutrition and Metabolism*. 2014; 64(3–4):332–339. DOI: 10.1159/000365042 [PubMed: 25300277]
- Institute of Medicine. Dietary reference intakes for energy, carbohydrates, fiber, fat, fatty acids, cholesterol, protein, and amino acids. Washington D.C: National Academies Press; 2005.
- Jain SK, Wise R, Yanamandra K, Dhanireddy R, Bocchini JA Jr. The effect of maternal and cord-blood vitamin C, vitamin E and lipid peroxide levels on newborn birth weight. *Molecular and Cellular Biochemistry*. 2008; 309(1–2):217–221. DOI: 10.1007/s11010-007-9638-8 [PubMed: 18049868]
- Jancevska A, Tasic V, Damcevski N, Danilovski D, Jovanovska V, Gucv Z. Children born small for gestational age (SGA). *Prilozi (Contributions)*. 2012; 33(2):47–58. [PubMed: 23425869]
- Kaiser LL, Allen LH, American Dietetic Association. Position of the American Dietetic Association: nutrition and lifestyle for a healthy pregnancy outcome. *Journal of the American Dietetic Association*. 2008; 102(10):1479–1490. DOI: 10.1016/j.jada.2008.01.030
- Knuist M, Bonsel GJ, Zondervan HA, Treffers PE. Risk factors for preeclampsia in nulliparous women in distinct ethnic groups: a prospective cohort study. *Obstetrics & Gynecology*. 1998; 92(2):174–178. [http://dx.doi.org/10.1016/S0029-7844\(98\)00143-4](http://dx.doi.org/10.1016/S0029-7844(98)00143-4). [PubMed: 9699746]
- Kovacs CS. Calcium and bone metabolism in pregnancy and lactation. *The Journal of Clinical Endocrinology and Metabolism*. 2001; 86(6):2344. <http://dx.doi.org/10.1210/jcem.86.6.7575#sthash.ZqFZ0ViL.dpuf>. [PubMed: 11397820]
- Krebs-Smith SM, Guenther PM, Subar AF, Kirkpatrick SI, Dodd KW. Americans do not meet federal dietary recommendations. *The Journal of Nutrition*. 2010; 140(10):1832–1838. DOI: 10.3945/jn.110.124826 [PubMed: 20702750]
- Ledikwe JH, Blanck HM, Khan LK, Serdula MK, Seymour JD, Tohill BC, Rolls BJ. Low-energy-density diets are associated with high diet quality in adults in the United States. *Journal of the American Dietetic Association*. 2006; 106(8):1172–1180. <http://dx.doi.org/10.1016/j.jada.2006.05.013>. [PubMed: 16863711]
- Lubchenco LO, Bard H. Incidence of hypoglycemia in newborn infants classified by birth weight and gestational age. *Pediatrics*. 1971; 47(5):831–838. [PubMed: 5573868]
- Maple-Brown LJ, Roman NM, Thomas A, Presley LH, Catalano PM. Perinatal factors relating to changes in maternal body fat in late gestation. *Journal of Perinatology*. 2013; 33(12):934–938. DOI: 10.1038/jp.2013.109 [PubMed: 24030674]
- Mathews F, Yudkin P, Neil A. Influence of maternal nutrition on outcome of pregnancy: prospective cohort study. *British Medical Journal*. 1999; 319(7206):339–343. <https://doi.org/10.1136/bmj.319.7206.339>. [PubMed: 10435950]
- Mehta SH. Nutrition and pregnancy. *Clinical Obstetrics and Gynecology*. 2008; 51(2):409–418. DOI: 10.1097/GRF.0b013e31816fda53 [PubMed: 18463470]
- Mikkelsen TB, Osler M, Orozova-Bekkevold I, Knudsen VK, Olsen SF. Association between fruit and vegetable consumption and birth weight: a prospective study among 43,585 Danish women. *Scandinavian Journal of Public Health*. 2006; 34(6):616–622. [PubMed: 17132595]

- O'Neill JL, Keaveney EM, O'Connor N, Cox M, Regan A, Shannon E, Turner MJ. Are women in early pregnancy following the national pyramid recommendations? *Irish Medical Journal*. 2011; 104(9):270–272. [PubMed: 22132595]
- Paul KH, Graham ML, Olson CM. The web of risk factors for excessive gestational weight gain in low income women. *Maternal and Child Health Journal*. 2013; 17(2):344–351. DOI: 10.1007/s10995-012-0979-x [PubMed: 22415812]
- Peña-Rosas JP, De-Regil LM, Dowswell T, Viteri FE. Daily oral iron supplementation during pregnancy (review). *Cochrane Database of Systematic Reviews*. 2012; 12:CD004736.doi: 10.1002/14651858.CD004736.pub4 [PubMed: 23235616]
- Phipps K, Barker DJP, Hales CN, Fall CHD, Osmond C, Clark PMS. Fetal growth and impaired glucose tolerance in men and women. *Diabetologia*. 1993; 36(3):225–228. DOI: 10.1007/BF00399954 [PubMed: 8462770]
- Ramón R, Ballester F, Iñiguez C, Rebagliato M, Murcia M, Esplugues A, Vioque J. Vegetable but not fruit intake during pregnancy is associated with newborn anthropometric measures. *The Journal of Nutrition*. 2009; 139(3):561–567. DOI: 10.3945/jn.108.095596. [PubMed: 19158218]
- Rao S, Yajnik CS, Kanade A, Fall CH, Margetts BM, Jackson AA, Desai B. Intake of micronutrient-rich foods in rural Indian mothers is associated with the size of their babies at birth: Pune Maternal Nutrition Study. *The Journal of Nutrition*. 2001; 131(4):1217–1224. [PubMed: 11285330]
- Rasmussen, KM., Yaktine, AL., editors. *Weight gain during pregnancy: Reexamining the guidelines*. Washington, DC: National Academies Press; 2009.
- Rifas-Shiman SL, Rich-Edwards JW, Willett WC, Kleinman KP, Oken E, Gillman MW. Changes in dietary intake from the first to the second trimester of pregnancy. *Paediatric and Perinatal Epidemiology*. 2006; 20(1):35–42. DOI: 10.1111/j.1365-3016.2006.00691.x [PubMed: 16420339]
- Rifas-Shiman SL, Rich-Edwards JW, Kleinman KP, Oken E, Gillman MW. Dietary quality during pregnancy varies by maternal characteristics in Project Viva: a US cohort. *Journal of the American Dietetic Association*. 2009; 109(6):1004–1011. <http://dx.doi.org/10.1016/j.jada.2009.03.001>. [PubMed: 19465182]
- Scholl TO, Chen X, San Khoo C, Lenders C. The dietary glycemic index during pregnancy: influence on infant birth weight, fetal growth, and biomarkers of carbohydrate metabolism. *American Journal of Epidemiology*. 2004; 159(5):467–474. <https://doi.org/10.1093/aje/kwh068>. [PubMed: 14977642]
- Siega-Riz AM, Bodnar LM, Savitz DA. What are pregnant women eating? Nutrient and food group differences by race. *American Journal of Obstetrics and Gynecology*. 2002; 186(3):480–486. <http://dx.doi.org/10.1067/mob.2002.121078>. [PubMed: 11904611]
- Stallings TL, Gazmararian JA, Goodman M, Kleinbaum D. Agreement between the perceived and actual fruit and vegetable nutrition environments among low-income urban women. *Journal of Health Care for the Poor and Underserved*. 2015; 26(4):1304–1318. [PubMed: 26548680]
- Thomas M, Weisman SM. Calcium supplementation during pregnancy and lactation: effects on the mother and the fetus. *American Journal of Obstetrics and Gynecology*. 2006; 194(4):937–945. <http://dx.doi.org/10.1016/j.ajog.2005.05.032>. [PubMed: 16580279]
- Webb JB, Siega-Riz AM, Dole N. Psychosocial determinants of adequacy of gestational weight gain. *Obesity*. 2009; 17(2):300–309. DOI: 10.1038/oby.2008.490 [PubMed: 19008871]
- Zhang Z, Kris-Etherton PM, Hartman TJ. Birth weight and risk factors for cardiovascular disease and type 2 diabetes in US children and adolescents: 10 year results from NHANES. *Maternal and Child Health Journal*. 2014; 18(6):1423–1432. DOI: 10.1007/s10995-013-1382-y [PubMed: 24241968]

Call Outs

1. More than half of all pregnant women do not eat the recommended daily amounts in each food group defined by the United States Department of Agriculture.
2. The diets of participants remained stable across the second and third trimesters and were largely inadequate during this time.
3. Nurses should provide nutritional counseling regarding inexpensive and culturally appropriate choices at any point of contact with pregnant women.

Table 1

Study Participant Demographics

Age	Range 18 years–43 years	Mean 26 years
	Frequency (N)	Percent (%)
Country of Birth		
United States	122	62.6
Jamaica	42	21.5
Nigeria	8	4.1
Gambia	7	3.6
Ghana	6	3.1
Other*	10	5.1
Marital Status		
Single	146	74.9
Married	46	23.6
Divorced	2	1
Separated	1	0.5
Level of Education		
<12 th Grade	37	19.0
12 th Grade	66	33.8
Some Postsecondary	85	43.6
Not reported	7	3.6
Income		
Under \$5,000	22	23.7
\$5,000–\$7,500	7	7.5
\$7,501–\$9,999	6	6.5
\$10,000–\$12,500	5	5.4
\$12,501–\$15,000	5	5.4
\$15,001–\$17,500	5	5.4
\$17,501–\$20,500	5	5.4
\$20,501–\$25,500	10	10.8
\$25,501–\$30,000	5	5.4
\$30,001–\$35,000	3	3.2
\$35,501–\$49,999	12	12.9
\$50,000 or more	2	2.2
Not reported	6	6.5
BMI		
<25	58	29.7
25–30	53	27.2
>30	84	43.1

Note. For country of birth, other includes individuals from Togo, Guyana, Ivory Coast, Mali, Mauritania, St. Lucia, Trinidad and Tobago, United Kingdom, and other countries not specified.

Table 2

Levels of Significance for Statistical Analysis over Time

Nutrient	Linear Fixed Effects Model (p-value)	Chi-Square (p-value)
Calories (kcal)	0.344	0.173
Protein (g)	0.354	0.791
Carbohydrates (g)	–	0.950
Fat (g)	0.356	–
Vitamin D (µg/d)	0.814	0.82
Folate (µg/d)	–	0.928
Iron (mg/d)	0.802	0.987
Calcium (mg/d)	0.65	0.719
Fruits & Veggies (servings)	–	–
Fiber (g)	0.53	0.369

Note. – Denotes size insufficient to conduct statistical analysis.

Table 3

Caloric Intake During the Second and Third Trimesters

Calories (kcal)	Time Point 1	Time Point 2	Time Point 3
Below	55.7% (108)	47.6% (81)	47.0% (78)
Within	21.6% (42)	30.6% (52)	24.7% (41)
Above	22.7% (44)	21.8% (37)	28.3% (47)

Note. Number in parentheses represents actual number of women.

Table 4**Macronutrient Consumption During the Second and Third Trimesters**

Nutrient	Parameter	Time Point 1	Time Point 2	Time Point 3
Protein (g)	Below	40.7% (79)	43.5% (74)	44.0% (73)
	Within	59.3% (115)	56.5% (96)	56.0% (93)
Carbohydrates (g)	Below	21.6% (42)	21.8% (37)	20.5% (34)
	Within	78.4% (152)	78.2% (133)	79.5% (132)
Protein (%)	Below	67.0% (130)	71.8% (122)	74.1% (123)
	Within	24.2% (47)	18.2% (31)	19.9% (33)
	Above	8.8% (17)	10.0% (17)	6.0% (10)
Carbohydrates (%)	Below	8.3% (16)	9.4% (16)	11.4% (19)
	Within	47.9% (93)	48.8% (83)	38.0% (63)
	Above	43.8% (85)	41.8% (71)	50.6% (84)
Fat (%)	Below	35.1% (68)	33.5% (57)	33.7% (56)
	Within	43.8% (85)	40.6% (69)	41.6% (69)
	Above	21.1% (41)	25.9% (44)	24.7% (41)

Table 5**Micronutrient Consumption During the Second and Third Trimesters**

Nutrient	Parameter	Time Point 1	Time Point 2	Time Point 3
Vitamin D (µg/d)	Below	96.4% (187)	95.3% (162)	95.2% (158)
	Within	3.6% (7)	4.7% (8)	4.8% (8)
	Above	0.0% (0)	0.0% (0)	0.0% (0)
Folate (µg/d)	Below	66.5% (129)	66.5% (113)	67.5% (112)
	Within	24.7% (48)	23.5% (40)	25.3% (42)
	Above	8.8% (17)	10.0% (17)	7.2% (12)
Iron (mg/d)	Below	63.4% (123)	63.5% (108)	62.1% (103)
	Within	28.9% (56)	28.2% (48)	30.7% (51)
	Above	7.7% (15)	8.3% (14)	7.2% (12)
Calcium (mg/d)	Below	54.6% (106)	59.4% (101)	55.4% (92)
	Within	43.8% (85)	38.8% (66)	44.0% (73)
	Above	1.6% (3)	1.8% (3)	0.6% (1)

Table 6

Average Intake of Nutrients by Trimester

Nutrient	Recommended Range	2 nd Trimester Average	3 rd Trimester Average
Calories (kcal)	1,900 – 2,500	1,990 (SD 879)	2,016 (SD 876)
Protein (g)	71	84.2 (SD 40.0)	80.9 (SD 37.3)
Carbohydrates (g)	175	272.3 (SD 132.4)	275.5 (SD 138.0)
Protein (%)	20 – 25	17.5 (SD 6.0)	16.7 (SD 5.7)
Carbohydrates (%)	40 – 55	54.4 (SD 11.1)	53.7 (SD 11.3)
Fats (%)	25 – 35	28.0 (SD 9.5)	29.6 (SD 9.2)
Vitamin D (μ/d)	15 – 100	6.2 (SD 4.4)	6.1 (SD 4.5)
Folate (μ/d)	600 – 1,000	590.8 (SD 373.2)	561.0 (SD 406.0)
Iron (mg/d)	27 – 45	27.6 (SD 17.1)	26.5 (SD 15.2)
Calcium (mg/d)	1,000 – 2,500	1,056 (SD 576)	1,011 (SD 472)
Fruits & Veggies (servings)	8	2.4 (SD 2.1)	2.2 (SD 2.0)
Fiber (g)	28	15.1 (SD 9.2)	14.8 (SD 8.8)