Highlights from

Baby Basics: An educational intervention in community health centers. Nassau County Department of Health, Division of Quality Improvement, Epidemiology and Research, 2014.[1]

Introduction:

Studies have historically shown that as female literacy rates increase, infant mortality decreases. Lower education levels of mothers correlates with poor health outcome in children. Baby Basics (http://www.whattoexpect.org/what-we-do/baby-basics/overview-baby-basics) is a low literacy prenatal care program that incorporates health literacy into the health care setting. Baby Basics provides prenatal materials to underserved families that are user-friendly, comprehensive, easy to read and serve as a catalyst for learning and family literacy. The program seeks to empower, engage and educate underserved parents to be effective users of the healthcare system and advocate for themselves and their families. The program also enlightens healthcare providers and educators to use health literacy and cultural competency tools and strategies to improve patient communication and compliance. An early study and case reports have shown that Baby Basics improves health literacy, satisfaction and engagement in prenatal health care http://www.whattoexpect.org/news. While health literacy and empowerment are important goals, the translation of that literacy into improved health is important to quantify. This, albeit a significant finding, should translate to improved health outcome for these mothers and their babies to be of maximum impact. Thus, it is important to be able to quantify the effect Baby Basics is having on the health of the babies born to mothers who have received education from this program in order to fully gauge its effectiveness. This report aims to quantify the benefit in health literacy and education gained by the women in this program and attempts to gauge any indirect effect that may have had on the health outcome of their babies.
Based on existing literature, we expect prenatal educational materials delivered at an appropriate literacy level to improve knowledge and behavioral changes during pregnancy.

Specifically, Baby Basics includes a monthly pregnancy book guiding the pregnant woman through nine months of pregnancy, including care for the woman, signs and symptoms, post-partum care, nutrition, drug use and miscarriage. The Baby Basics planner encourages women to keep track of provider appointments, ask questions of the medical staff, and maintain contact information. Mom's Club is a voluntary support group of pregnant women led by a trained Baby Basics Clinic Supervisor. The program is available in multiple languages.

The inclusion of the Baby Basics program in 2010 in some, but not all, health center based health centers offering prenatal care to underserved residents provided an opportunity to study knowledge-based change as it pertains to low-income pregnant woman in Nassau County, NY.

Study Design:
The study consisted of a pre and post implementation survey to evaluate the association between participation in the Baby Basics program and an improved knowledge base of healthy pregnancy practices and behaviors. Pregnant women received the Baby Basics book and planner in their language of choice (English or Spanish) at their initial prenatal visit regardless of pregnancy month. Recruitment for study took place at this initial visit by the Baby Basics facilitators under the supervision of the Baby

[1] This project would not have been complete without the extensive participation from Winthrop Women's Wellness OB/GYN, Hempstead, NY

Basics Clinic Supervisor. Each Baby Basics facilitator was trained to explain the study and trained to explain informed consent. Consent included permission to use contact information to track subjects, including WIC (Women Infant and Children) appointment information. Subjects providing informed consent were enrolled, given a self-administered pre-implementation survey and submitted the completed surveys to the facilitator. Pre survey results determined the baseline knowledge and behaviors of participants regarding healthy pregnancy practices. Study participants were followed until six weeks post-delivery at which point the self-administered post-implementation survey were given. The post test was used to assess changes in knowledge and behaviors of pregnant women upon completion of the Baby Basics program. Pre and post surveys were linked by clinic medical record number.

The study sought to include cases from NuHealth Family Health Centers in Hempstead (Hempstead) and Freeport-Roosevelt (Freeport), South Nassau Family Medicine (SNCH) and Winthrop Women's Wellness OB-GYN (Winthrop). Controls were derived from NuHealth Family Health Center at Nassau University Medical Center (NUMC), NSLIJHS Family Medicine Center at Glen Cove Hospital (Glen Cove) and NSLIJHS Irving Goldman Family Care Center in Manhasset (Manhasset). These control subjects were given both pre and post surveys and recruited and tracked in the same manner.

The study investigators chose to include pregnant women who provided informed consent and who were patients at these facilities. Pregnant women who received home visitation and/or case management were excluded. After enrollment, if a subject began receiving home visitation and/or case management she was withdrawn from the study. If a subject failed to continue to receive prenatal care at study locations, attempts were made to contact her to follow-up at the six week post delivery date. Inherent in a study of follow-up study of pregnant women is the duration of pregnancy. For that reason, post-survey follow-up is dependent on stage of pregnancy in which the woman was recruited and date of recruitment and therefore spans the months of the study entirety.

Analysis:

Participant surveys were coded with a unique identifier, the clinic medical record number, in order to link pre and post answers. Pre and post questionnaires were entered and coded using SAS statistical package. Descriptive statistics were generated to describe populations. Demographic data was illustrated using pie charts and tables including percentages. All other data was analyzed using a combination of independent samples T-test, paired T-test, and logistic regression utilizing the standard 95% Confidence intervals for significance. All analysis was conducted in SAS version 9.3.

Survey Scores and Competency

Participants were given scores based on the correct number of questions answered on both the pre and post surveys. Separate scores were recorded for both pre and post surveys including separate scores for controls and cases. Only post survey scores (for cases and controls) were converted to percentages with 70% or more being defined as competent in knowledge and appropriate practices as recommended for pregnant women. Those with scores less than 70% were considered not competent in knowledge and appropriate practices recommended for pregnant women. This competency variable served as a surrogate for knowledge gained through the Baby Basics program for cases and as a comparison parameter in the controls.

This study was approved by Stony Brook University IRB in January of 2011.

Results:

Study Demographics

Overall, there were 1049 participants recruited for the study only 315 (30%) completed a follow-up post survey. The average age of participants (95.2% reported age) was 27 years of age. Participants recruited for the study were representative of a mixed racial population. Approximately 32.2% (264) women identified themselves as White, 26.34% (216) women identified themselves as Black, 4.63% (38) women identified themselves as Asian, 36.1% (296) women as something Other than the three races. Ethnically, 69.93% (686) women identified as Hispanic and 29.97% (294) women identified as Non-Hispanic.

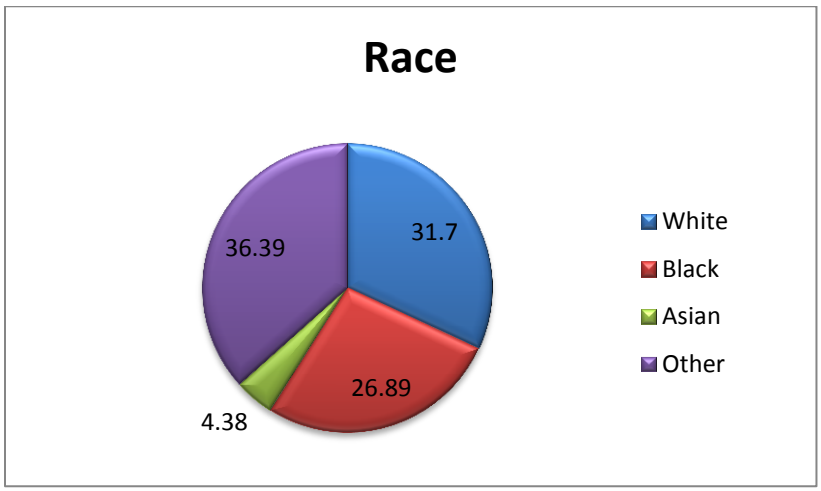

Figure 1: Race of each participant by percentage

Pregnancy Status

Of the 1049 participants, 576 (57.66%) were in their 1st trimester upon entering the program, 269 (26.93%) women were in their 2nd trimester, 121 (12.11%) were in their 3rd trimester, and 33 (3.30%) weren't sure which trimester they were in. For the majority of women, 63.24%, this was NOT their first pregnancy. For 36.76% of the women, this was their first pregnancy.

Table 1: Pregnancy status of all participants

N=1049	Pregnancy Status	1st Pregnancy
1st Trimester	576 (57.66%)	-
2nd Trimester	269 (26.93%)	-
3rd Trimester	121 (12.11%)	-
Not Sure	33 (3.30%)	-
Yes	-	375 (36.76%)
No	-	645 (63.24%)

Education

One hundred and twelve (11.45%) of the 1049 participants had less than a high school education, 217 (22.29%) had some high school education, 301 (30.78%) had a high school diploma or equivalent, 190 (19.43%) had some college education, 110 (11.25%) had a college diploma, and 47 (4.81%) had a graduate or professional degree.

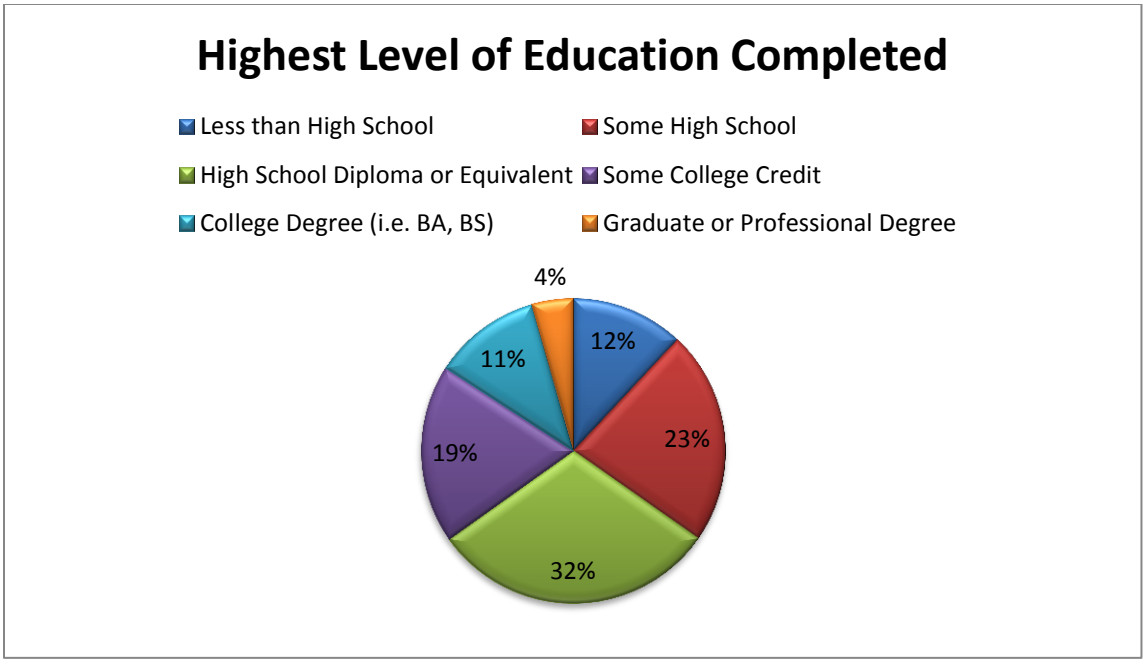

Figure 2: Highest level of education completed by each participant

Health Center Response Rate and Loss to follow-up

For pre survey cases, Winthrop recruited 415 participants, Freeport recruited 22 participants, Hempstead recruited 79 participants, and SNCH recruited 176 participants. For post survey cases, Freeport retained 2 participants, Hempstead retained 9 participants, SNCH retained 17 participants, and Winthrop retained 246 participants.

Table 2a: Health center retention rate for cases

Health center	Pre-Survey Cases	Post-Survey Cases	Retention Rate (%)
Winthrop	415	247	59.51807229
Freeport	22	2	9.090909091
Hempstead	79	9	11.39240506
SNCH	176	17	9.659090909
Total	692	275	39.73988439

For pre survey controls, Glen Cove recruited 36 participants, Manhasset recruited 176 participants, and NUMC recruited 145 participants. For post survey controls Glen Cove retained 4 participants, Manhasset retained 31 participants, and NUMC retained 5 participants.

Table 2b: Health center retention rate for controls

Health Center	Pre-Survey Controls	Post-Survey Controls	Retention Rate (%)
Glen Cove	36	4	11.11111111
Manhasset	176	31	17.61363636
NUMC	145	5	3.448275862
Total	357	40	11.20448179

Case vs. Control (Competency)

Logistic regression analysis was conducted to determine if being a "Case" participant (meaning being exposed to the Baby Basics program) affected a participant's competency level as compared to being a control. For the 136 (cases and controls) participants for which both scores data was available, it was found that Cases had 4.2 (95% CI: 1.678, 10.511; p=.0022) times greater odds of being competent than controls.

Table: 3 Logistic regression of competency (case vs. control)

Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept		1	-0.3365	0.414	0.6604	0.4164
Case		1	1.4351	0.468	9.4019	0.0022
Odds Ratio Estimates						
Effect	**Point Estimate**	**95% Wald Confidence Limits**				
Case vs. Control	4.2	1.678, 10.511				

Adjusting for possible confounders: race, education and first pregnancy

When adjusting for race, there were no significant effects to be noted to the logistic regression model. When adjusting for each race, there were no significant confounding effects to be noted (analysis not shown). Thus, race was not included in our adjusted model. The same was true for education. Women for whom this was not their 1st pregnancy had a 3.54 time significant greater odds of being competent in proper pregnancy practices than women for whom this was their 1st pregnancy. This means that having a prior pregnancy was a confounder and should be added to the adjusted model.

Table 4: Logistic regression for 1st or prior pregnancy and competency

Odds Ratio Estimates	Column1	Column2
Effect	Point Estimate	95% Wald Confidence Limits
Prior pregnancy	3.54	1.652, 7.587

Adjusted model for Competency

In the adjusted model, it was found that after adjusting for confounders (in this case 1st pregnancy status was the only confounder used), those participants who were "cases", namely, part of the Baby Basics program were at a 3.428 time greater odds of being competent than those who were not part of the Baby Basics program. However, it was important to note that prior pregnancy had an effect to the extent that women with prior pregnancies were at a 3.113 times greater odds of being competent than for those women that were pregnant for the 1st time.

Table 5: Adjusted model with prior pregnancy in the model

Effect	Point Estimate	95% Wald Confidence Limits
Case vs. Control	3.428	1.32, 8.905
Prior Pregnancy	3.113	1.419, 6.83

Conclusions and Limitations

This case-control survey based study is the first to attempt to quantify the benefits of the Baby Basics program towards education of women regarding healthy pregnancy practices. Of the participants, racially, there was a fairly proportional distribution amongst Whites, Blacks, and "Other" while the Asian race was not very well represented by the population sample. This sample's high representation of "other" race may have been due to misclassification of Latino or Spanish as a race as opposed to an ethnicity by the participant at the time of the initial survey. We make this speculation because nearly 70% of women identified themselves as Hispanic when asked in a latter question.

In the initial (pre-analysis) sample, the majority of women (55%) had a high school degree or less. Similarly, in the post-survey (analysis) sample, approximately 61.2% of women had a high school degree or less. This consistency in the percentages of women at a certain education level in both pre and post analysis samples (despite large differences in total number of women because of loss to follow-up) helps eliminate a possibility of selection bias for women continuing on with the study. However, due to loss to follow-up, no other conclusions can be drawn about the differences between the pre and post group regarding education except for the relative ratios of each group.

Women actually breastfeeding at the time of the post-survey was markedly reduced when compared to women who intended to breastfeed at the time of the pre-survey (62.11% vs. 87.89%). However, due to loss to follow-up, analysis conducted on this data was eliminated as there are no meaningful conclusions to be drawn. Similarly, behavior analysis for smoking and drinking prior to and post-partum was eliminated due to lack of power and loss to follow-up.

Our main variable of interest in this study, *competency* (categorical), was generated in order to quantitatively gauge the effect (if any) Baby Basics had on the knowledge of these women regarding healthy pregnancy practices when compared to women who did not participate in the program. Thus,

competency was used only as a gauge after the program had concluded. The 70% cutoff was set arbitrarily since no level of competency has been established in the literature. Similarly, the score (numerical) variable was solely utilized in order to effectively compare knowledge between participants in time. That is to say, how did a participant's score, who underwent the Baby Basics program, differ from their score when they started? The variables were deliberately designed this way for several reasons. Firstly, our main purpose of this study was to gauge the effectiveness of the Baby Basics program. This could only be done at the conclusion of the program for the sample population chosen. Therefore, establishing a competency variable utilizing only the post survey scores would allow us to compare cases to controls while adjusting for possible confounders in our model. This would demonstrate the actual effect on competency of participants that Baby Basics had when compared to participants who were in the control group (did not receive Baby Basics). Secondly, a numerical score variable would allow us to detect any associations or differences between cases and controls (or cases v. cases; controls v. controls) as necessary and reveal any possible selection bias in our study. Lastly, analyzing the effectiveness of the program both numerically and categorically would provide us with a more concrete explanation as to why we observe the results we have.

Mean scores amongst cases (enrolled in Baby Basics program) were shown to be significantly higher in women after participating in the Baby Basics program. There was no significant difference in the mean scores of cases and controls prior to the start of the program. There was also no significant difference in the mean scores of controls from the beginning to the end of the study. Lastly, there was no significant difference in the means scores between cases and controls at the conclusion of the study. The important thing to note here is that, although there was no evidence of a significantly better mean score when comparing cases to controls after the program had concluded, there was a difference amongst the scores of the cases when comparing their pre-score and post-score. This implies that Baby Basics may have had a positive effect on the knowledge/literacy of the women enrolled in it; represented by a 6.6% increase in average score between the post and pre cases. Another important thing to note is the lack of a difference in average score between cases and controls prior to the start of the program. This finding eliminates sample selection bias when choosing the sample population.

Without adjusting for confounders, participants of the Baby Basics program were at a 4.2 times greater odds of being competent regarding proper pregnancy practices than women who were part of the control group (Table 3). This finding suggests that women who participated in the Baby Basics program developed a better understanding of healthy pregnancy practices by the end of the program when compared to women who were not in the program. Furthermore, after adjusting for confounding factors such as race, education, and prior pregnancy status, participants of the Baby Basics program were at a 3.428 times greater odds of being competent than women who did not participate in Baby Basics. It is important to note, however, that having a prior pregnancy was also associated with a 3.113 times greater odds of being competent when placed into our model and did affect the magnitude of our result albeit slightly.

With these results in mind, it is important to view these findings while considering the limitations of this study. As with any epidemiological research there exists, amounts of uncontrollable bias that would affect any study. But for this study, in particular, a severe limitation was the loss to follow-up of participants and the lack of complete data in the survey questionnaire (although the latter is expected in survey type research). Having lost all but 24 of the control participants significantly lowered the power of this study and therefore, much of the results are inconclusive. Along those lines, analyzing an isolated sample in the Long Island (Nassau County) area may have biased the study. Furthermore, only one health center, Winthrop Women's Winthrop Women's Wellness OB/GYN in Hempstead, NY was able to maintain follow-up. To extrapolate findings on one center should be done cautiously. But despite its

limitations, this study pioneered an attempt at gauging the benefit the women enrolled in the Baby Basics program. It was the first study that created a competency variable by which to quantify the educational success. Future studies should aim to further enhance the competency variable created in this study by adding dimensions to the variable previously unexplored or improving the definitions of competency as the Baby Basics program progresses. Also, future research may delve into the program's impact on health outcome of the baby post pregnancy.