Impact of *Beginnings Pregnancy Guides* on Maternal Health Literacy among Medicaid Patients in Group Prenatal Care

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Abstract

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Background: Maternal health literacy (MHL) represents the cognitive and social skills that determine the motivation and ability of mothers to gain access to, understand, and use information and services in ways that promote and maintain their health and that of their children. While the dominant viewpoint of health literacy is that it is dependent on reading proficiency, recent research suggests that reading proficiency is neither necessary nor sufficient to use information in ways that promote and maintain health. CenteringPregnancy (CP), a group prenatal care program, and *Beginnings Pregnancy Guides* (BG), pregnancy education materials, are hypothesized to promote maternal health literacy.

Objectives: To document the feasibility and impacts of integrating MHL promotion into CP with and without BG, to document participants' use and satisfaction with BG, and to validate the maternal health literacy self-assessment.

Methods: A nonrandomized pretest-posttest control group study design was used to estimate the incremental effects of CP with BG versus CP alone. Participants at the experimental site received BG educational materials in addition to CP whereas the control site received CP without addition of BG. Data were collected through three methods: the Maternal Health Literacy Self-Assessment (MHL-SA), intervention group surveys, and semi-structured phone interviews with facilitators. McNemar's test was performed on participants' pre and post MHL-SA questions for both the intervention and control groups. The outcome in the intervention group was compared to the outcome in the control group using a Generalized Estimating Equation (GEE) to determine the impacts of integrating health literacy promotion into CP with and without BG.

Results: Results indicated high levels of MHL at pretest and small increases at posttest. The most significant changes were in the health promotion domain, particularly in recognition of domestic violence. Changes attributable to BG were difficult to determine, because only 19% of participants read all or most of the BG booklets. Significant odds ratios were evenly distributed between the intervention and control groups signifying minimal impact of BG on MHL.

Conclusions: The present study provides insights into interventions that can be enhanced to promote MHL. Findings indicate that it is feasible to integrate MHL promotion into CP with and without BG and that CP has the potential to promote MHL in

the health promotion domain. More consistent exposure to BG across the duration of the program would provide more conclusive results of BG's impact on MHL promotion.

Chapter 1: Introduction

Background

According to the World Health Organization (WHO), health literacy represents the cognitive and social skills that determine the motivation and ability of individuals to gain access to, understand, and use information in ways that promote and maintain good health (WHO, 1998). Health promotion scholars define three levels of health literacy: functional, interactive, and critical health literacy (Nutbeam, 2000). Functional health literacy is defined as a person's ability to perform basic reading and numeric tasks in the healthcare context. Interactive health literacy is defined as advanced cognitive and literacy skills that can be used to actively participate in everyday activities, to extract information and derive meaning from different forms of communication, and to apply new information to changing circumstance in health and healthcare settings. Finally, critical health literacy is defined as more advanced cognitive skills that together with social skills, can be applied to critically analyze information, and to use this information to exert greater control over life events and situations related to health. In the health literacy field, the dominant viewpoint states that health literacy depends on functional literacy, which has been described as health-related literacy (Baker, 2006). However, recent research suggests that reading proficiency is neither necessary nor sufficient to use information in ways that promote and maintain health (Carroll et al, 2015). To maintain health requires interactive and critical skills, which can be developed without functional literacy. Health literacy literature cites two distinctive paradigms of health literacy: health literacy as a clinical risk and health literacy as a personal asset

(Nutbeam, 2008). For the purposes of this study, the WHO definition of health literacy as a personal asset, or life skill, made specific to mothers will be applied.

According to the theory of multiple literacies, each individual possesses several literacies (Hull et al, 2003). For example, functional literacy includes reading and writing, cultural literacy includes competence with the meaning system of social practices, and digital literacy includes the ability to judge and communicate information presented in electronic formats. Health literacy includes management of health and health care for oneself and one's community (Sorensen et al, 2011). Maternal health literacy (MHL), a subset of health literacy, is a specialized literacy because healthy maternity requires particular health literacy skills, such as the ability to detect risks, knowledge of action to take for a healthy pregnancy, and avoidance of an unhealthy lifestyle (Ohnishi et al, 2005). Adapted from the WHO definition of health literacy, MHL is defined as "the cognitive and social skills which determine the motivation and ability of mothers to gain access to, understand, and use information [and services] in ways that promote and maintain their health and that of their children" (Renkert and Nutbeam, 2001). The goal of promoting MHL is to empower mothers to gain control over personal and child health in three broad domains: disease treatment and healthcare, disease prevention and health protection, and health promotion, all of which benefit the health of both the mother and the child (Kickbusch, 2001; Sorensen et al, 2011). The World Bank (2016) defines empowerment as the ability to make choices and transform theses choices into desired actions and outcomes and is aligned with this conception of MHL. Most health literacy research in the United States has focused on disease treatment and healthcare exclusively; however, all three domains are required to promote and maintain health

(Smith, in press). Thus, it is important to study and measure health literacy improvements in all domains.

Nearly every U.S. study has used the Rapid Estimate of Adult Literacy in Medicine (REALM), the Test of Functional Health Literacy in Adults (TOFHLA), or the Newest Vital Sign (NVS) screening tool to measure health literacy (Bass et al, 2003; Parker et al, 1995; Mays et al, 2005). The Life Skills Progression (LSP) instrument was the first instrument used to measure progress in developing MHL skills (Wollesen & Peifer, 2006). It is an outcome measurement tool that is used to guide interventions and monitor progress in developing life skills needed to raise a healthy, competent child. LSP measures of information seeking, use of healthcare services and community resources, health behaviors, preventive practices, and maintenance of safe environments are collected to evaluate MHL levels. Smith derived two scales from the LSP to measure MHL: the Healthcare Literacy Scale, which uses 9 LSP items related to the disease treatment and healthcare domain, and the Self-care Literacy Scale, which uses 7 LSP items related to the disease prevention and promotion domains (Smith, 2009).

For this project, Smith and colleagues developed the Maternal Health Literacy Self-Assessment to integrate MHL into the CenteringPregnancy model of group prenatal care. The Maternal Health Literacy Self-Assessment (MHL-SA) was developed to document mothers' knowledge and behaviors regarding key messages conveyed over the course of CenteringPregnancy (CP). CP participants completed the MHL-SA twice, during the second and ninth group visits. The evidence-based key messages, and thus behavioral and knowledge related outcomes, measured in the MHL-SA include: eat

well, gain weight, take prenatal vitamins, be alcohol free, be drug free, be smoke free, and call for help (Rosen, 1989). Like the LSP, the MHL-SA focuses on progress to risk reducing and health promoting behaviors and healthcare practices and considers the social contexts in which mothers use information.

Smith and Carroll (in press) reviewed five programs that evaluated the impact of integrating MHL promotion into existing home visiting programs using BG and the LSP instrument. Home visiting is a preventive intervention that supports families and healthy development of children. The results of the study demonstrated that MHL scores improved continuously throughout 24 months of participation in home visiting programs that were enhanced to promote MHL. Participating mothers showed significant improvements in risk behaviors, preventive practices, and utilization of healthcare and community services. Improvements in these categories fall into the three broad domains that represent the goal of MHL promotion: disease treatment and healthcare, disease prevention and health protection, and health promotion

Significance

While the burden of health-related literacy is well documented, the burden of MHL is still under researched (National Center for Education Statistics, 2006; United States Department of Health & Human Services, 2008). This is demonstrated by the limited number of tools available to measure MHL as a personal asset and in programs enhanced to promote MHL as a life skill. Even though the level of health literacy is often not known, there are child development and public health priority issues that are impacted by MHL. The United Nations Economic and Social Council named health literacy and women's empowerment as a strategy to reduce the burden of non-communicable disease and related disparities (2010). This priority is based on strong

evidence regarding the developmental origins of health and disease and the influence of mothers' health behaviors, self-care, and healthcare practices during pregnancy on both her and her child's health (Silveira et al, 2007). Improved MHL is important to the achievement of health across the life course.

Health literacy is linked both to the individual and community socioeconomic context (Logan et al, 2015). Within the health literacy as a personal asset paradigm, context is critical. Actions to address health literacy require acknowledgement of social and environmental influences on individual choices (Rowlands et al, 2017). Social determinants of health are factors that determine whether developmental predisposition to adult disease is expressed (DHHS, 2017). Social determinants that influence levels of health literacy, such as age, race and ethnicity, education, marital status, and language, can all be linked to household income. Because social determinants shape parents' health and health literacy, thus impacting child development before birth, adult health disparities are perpetuated (Shonkoff & Phillips, 2000). These disparities persist as the cycle continues from generation to generation. Research documents the importance of maternal empowerment and its potential to improve MHL and reduce related maternal-child health disparities (Abada & Tenkorang, 2012; DeWalt & Hink, 2009). Although these findings are accepted, there is limited research to determine how health literacy specifically relates to health disparities and to evaluate interventions related to health literacy that may eliminate these disparities (Paasche-Orlow & Wolf, 2010).

Program and study objectives

CenteringPregnancy consists of group prenatal care that follows the American Congress of Obstetrics and Gynecology's current recommendation of ten prenatal visits.

However, each CP visit is ninety minutes to two hours long, giving women ten times more time with their prenatal care providers than conventional individual prenatal visits. Mothers engage in their own care by taking their own health assessments, such as weight and blood pressure, while each has a private visit with their provider. The remainder of the visit is spent with the provider, support staff, and a group of 8-10 other mothers with similar due dates, participating in facilitated discussions and interactive activities that address timely health topics, such as nutrition, stress management, labor and delivery, breastfeeding, and infant care. The CP model is recognized as a clinically effective and efficient model of patient-centered care (Thielen, 2012). With its emphasis on facilitated group interaction, purposeful self-reflection, social support, and intent to empower mothers, CP is hypothesized to promote MHL.

The focus of this study is a demonstration project that was funded by Anthem-WellPoint Insurance to incorporate MHL promotion into CP as a strategy to empower mothers as managers of personal and child health, and thereby improve pregnancy and child development outcomes, promote maternal-child health and prevent future non-communicable disease in both mother and child. Evidence-based health education materials designed to promote maternal health literacy, *Beginnings Pregnancy Guides*, were introduced into CP as part of this project.

Beginnings Pregnancy Guides (BG) are pregnancy and parenting education materials designed to complement prenatal and well-child visits and to promote MHL and other essential life skills for parents. The guide is a series of 6 booklets totaling 96 pages that is referenced by gestational care and follows the usual course of prenatal care visits. BG, as well as CP, are based on the 1989 US Public Health Service

Guidelines for the Content of Prenatal Care that are endorsed by the American College of Obstetricians and Gynecologists and remain the standard in the US and Canada. A panel of experts produced the publication *Caring for Our Future, The Content of Prenatal Care*, which outlined the health promotion content of each visit (Rosen, 1989). The panel identified seven health behavior topics that are linked to pregnancy outcomes. Kogan et al (1994) tested these recommendations, most notably the health behavior messages, with a nationally representative population of over 9,000 mothers. These messages are: eat well, gain weight, take prenatal vitamins, be alcohol-free, be drug-free, be smoke-free, and call for help. These key messages that are the foundation of BG and the CP curriculum.

This evaluation will explore the benefits, supports, and barriers in establishing Enhanced CP+ (CP + MHL + BG) to incorporate MHL promotion by comparing Enhanced CP+ to Enhanced CP (CP + MHL). The purposes of the study are 1) to document the feasibility and impacts of integrating MHL promotion into CP with and without BG, 2) to document participants' use and satisfaction with BG, and 3) to validate the maternal health literacy self-assessment. The following process and impact questions will be assessed:

Evaluation questions

<u>Process</u>

1. Can the MHL-SA be used as a meaningful measure of MHL?
2. What are the characteristics of participants in the experimental and control groups?

3. What percentage of participants used BG? What percentage of these participants were satisfied with BG?
4. What are the facilitators' perceptions of supplementing the curriculum with BG?
5. Is it feasible to integrate MHL promotion into CP?

Impact

6. Does CP promote MHL?
7. Does Enhanced CP+ (CP+ MHL +BG) promote MHL more than Enhanced CP (CP +MHL)?

Chapter 2: Methods

Study design

A nonrandomized pretest-posttest control group study design was used to estimate the incremental effects of CP on MHL with BG versus CP alone. Participants at the experimental site received BG educational materials in addition to the CP workbook whereas the control site received "usual care" (CP without addition of BG). CP facilitators at the intervention site received a two-hour introductory training and instructional handouts for each booklet to aid in incorporating BG into their sessions. For continuous outcome measures, the effect of BG is estimated by calculating the average difference between the participants' pretest and posttest scores in the experimental group and the average difference between the participants' scores for the control group. If BG is effective in promoting maternal health literacy (MHL), the difference for the experimental group should be significantly greater than the difference for the control group.

Although this study design typically eliminates most threats to internal validity, there is still the issue of bias, specifically selection bias and attrition. First, there may be inherent differences between the control and experimental sites, thus testing for significant differences in participant characteristics between the two groups were conducted in the analysis. Second, there may be some participants who dropped out of CP, did not attend all of the sessions, or did not complete both a pretest and posttest assessment. The process evaluation questions examine the other issues that may reduce participants' exposure to the intervention. Only participants who completed both assessments were included in the analysis.

Population and sample

The study was conducted at two randomly selected CenteringPregnancy sites in South Carolina (control site) and North Carolina (experimental site). Data were collected from these sites over the course of 2014-2015. There were multiple populations of interest in this evaluation: 1) all participants (n=171), 2) participants at the experimental site (n=100), 3) participants at the control site (n=71), 4) research coordinators at both sites (n=2), and 5) facilitators at the experimental site (n=4). Participants were enrolled in CP programs at the two sites over the course of 2014. CP participants were informed of the study by the experimental site coordinator. None declined to participate. Criteria for study inclusion were: pregnant during 2014, received care at CP site, and began enrollment in CP program in 2014. For questions regarding coordinators and facilitators, both coordinators were interviewed, and four facilitators were interviewed based on availability and willingness to participate.

Quantitative and qualitative measures

Tables 1a and 1b present the intervention measure, dependent measures, and covariates and their definitions, along with the review of the qualitative information**.** This evaluation aims to measure the incremental impact of BG on MHL, therefore BG is the intervention variable, and MHL is the dependent variable. MHL is measured through items (n=29) in the Maternal Health Literacy Self-assessment [Appendix A] for the three domains of maternal health literacy: health care and disease treatment (n=8), health protection (n=6), and health promotion (n=15). Variables about use and satisfaction with BG were collected in an additional post-test survey [Appendix B] administered to

experimental group participants. Qualitative information was collected through semi-structured interview questions, found in Appendix C.

Table 1a. Definitions of Quantitative Independent and Dependent Measures

Definitions of Independent and Dependent Variables	
Intervention Variable: Use of *Beginnings Pregnancy Guides* in the Experimental Group	
Variable	**Definition**
Beginnings Pregnancy Guides	Education materials to promote maternal health literacy; either were introduced or not introduced (yes/no)
Dependent Variable(s): Maternal Health Literacy	
Variable	**Definition**
<u>Disease treatment and healthcare</u> Regular healthcare provider	I have a healthcare provider that I go to when I am not pregnant (Yes/No/I go to the emergency room when I want to see a doctor)
WIC/Food Stamps use	I use WIC or food stamps when I need to (Yes/No/I'm never short of food)
Ease of finding health information	How easy or difficult is it to find information you need to keep yourself healthy? (Very easy/Easy/Difficult/Very difficult)
800 number or hotline usage	I have called an 800 number or a hotline for help or information (Yes/No, never)
Prenatal question to provider	I have asked my prenatal care provider a question about pregnancy (Yes/No)
Online health info resource use	I have found health information online. (Yes/No, never)
Understanding of pregnancy information	How easy or difficult is it to understand information about pregnancy and birth? (Very easy/Easy/Difficult/Very difficult)
Confidence in being good mother	How confident do you feel today about being a good mother? (Very/Somewhat/A little/Not at all confident)
<u>Disease prevention and health protection</u> Healthy beverage decisions	I choose to drink milk or water instead of soda pop or sweet tea (Always/Usually/Sometimes/Never)

Pregnancy weight goal	I have set a weight goal for my pregnancy (Yes/No)
Prenatal vitamin use	I take prenatal vitamins (Every day/Most day/Some days/Never)
Drug use	I am drug free/I use drugs/I cut back for pregnancy/ I am in a treatment program
Alcohol use	I am alcohol free/I drink alcohol/I cut back for pregnancy/I go to AA group
Tobacco use	I am smoke free/I use tobacco/I cut back for pregnancy/I go to quit classes
<u>Health promotion</u> Exercise	I exercise at least 30 minutes (Everyday/Most day/Some days/Never)
Domestic violence recognition	Domestic violence includes being hit or beaten (Yes/No) Domestic violence includes seeing friends when you choose (Yes/No) Domestic violence includes having say in financial decisions (Yes/No) Domestic violence includes being told how to act (Yes/No) Domestic violence includes having your partner check up on you (Yes/No) Domestic violence includes forced sex (Yes/No)
Birth control plan	I plan to use birth control after my baby is born/I have not thought about family planning
Use of stress relief methods	I practice deep breathing or other stress relief method (Everyday/ Some days/ Most days/ Never)
Condom use	I ask my partner to use a condom (Always/Usually/Sometimes/Never)
Self-care	If I feel sad and cry often for no reason for a few days, I will: Get extra rest/ Go to a hospital emergency room/Ask for help with daily tasks/Call my healthcare provider
Teeth brushing frequency	I brush my teeth twice a day (Everyday/ Most days/ Some days/ Never)
Use of BG	I read the *Beginnings Pregnancy Guide* booklets (No, none/1 or 2/3 or 4/5 or 6)
Satisfaction with BG	I would recommend *Beginnings Pregnancy Guide* for others like me (No, because/ Yes, because)
Covariates	
Variable	**Definition**
Age	Age, in years, of participant
Race	Racial or ethnic categories (White, Black, Hispanic/Latina, Other)

Education Level	High school graduate, no degree, enrolled, beyond
Language	English, Spanish, Other, Multiple
Number of Pregnancies	1, 2, 3, more than 3
Location	Greenville or Asheville
Read for fun	Often, sometimes, rarely, never
Session Number	2-10
Sessions Attended	1-10

Table 1b. Qualitative Information Domain and Corresponding Question

Topic	**Question**
Protocol adherence	Did you find it necessary or beneficial to change the protocol? (If yes, what did you change? why? how well did that work?)
Feasibility of BG implementation	Rate the ease of integrating BG into your sessions on a scale of 1-5; What would you do differently to integrate?
BG Usability	Would you want to continue using BG in your groups?
Introduction of books	Did you introduce about all the books to your groups? (If no which ones left out? Why?)
Impact of BG	Did BG change the discussion?

Data sources

There were three main tools of data collection: maternal health literacy self-assessments, experimental group survey, and semi-structured interviews. Participants completed the MHL-SA at Session 2 and at Sessions 8, 9, or 10.The assessments were administered and collected by each site's research coordinator. To protect participant confidentiality, the MHL-SA used a self-coding procedure that allows linking together of participants' two assessments without identifying information. Quantitative measures about use and satisfaction with *Beginnings Guides* were collected through a survey

administered to the experimental site groups alongside their second MHL-SA. Semi-structured phone interviews were conducted with CP facilitators and research coordinators at the experimental site. Information regarding adherence to study protocol was gathered through semi-structured phone interviews with research coordinators.

Table 2 documents the variables that were used to answer each evaluation question and the sources from which they were collected. Variables for evaluation questions 1, 2, 3, 6, and 7 will be collected through quantitative means to estimate the impact of CP and BG on participants' levels of MHL. Quantitative data were primarily collected using the Maternal Health Literacy Self-Assessment instruments (MHL-SA), found in Appendix A. The MHL-SA is a 38-item survey that documents mothers' use and understanding of key messages received in CP. Quantitative measures about use and satisfaction with *Beginnings Guides* were collected through an additional 13-item survey administered to the experimental site groups alongside their second MHL-SA, found in Appendix B. Evaluation questions 4 and 5 will be addressed through qualitative means to gain a more robust understanding of implementation and feasibility of integration.

Table 2. Evaluation Questions and Corresponding Variables

Evaluation Question	Population	Variable	Source
Can the MHL-SA be used as a meaningful measure of MHL?	Participants at both experimental and control sites	Maternal health literacy variables	MHL-SA
What are the characteristics of participants at the experimental and control sites?	Participants at both experimental and control sites	Age, race, education level, number of pregnancies, number of classes attended	MHL-SA

How many participants used BG? Were participants satisfied with BG?	Participants at experimental site	Number of participants who used BG; Satisfaction of participants	Survey
What are the facilitators' perceptions of supplementing the curriculum with BG?	Research coordinators; Facilitators	"Would you want to continue using BG in your groups?" (y/n)	Semi-structured interview
Is it feasible to integrate MHL promotion into CP model?	Research coordinators; Facilitators	Ease of integration (scale of 1-5)	Semi-structured interviews
Does Enhanced CP (CP + MHL) promote MHL?	Participants at control site; Participants at experimental site	Maternal health literacy variables	MHL-SA
Does Enhanced CP + (CP + MHL + BG) promote MHL more?	Participants at control site; Participants at experimental site	Maternal health literacy variables	MHL-SA

Descriptive and statistical data analysis

All data were collected and coded in Excel and analyzed in STATA. All participants who enrolled in the study and completed both MHL-SA1 and MHL-SA2 were included in the analysis (n=171).

Process

1. *Can the MHL-SA be used as a meaningful measure of MHL?*

To test the MHL-SA tool for reliability, participants at the control sites were sent home with an additional MHL-SA1 after their second session to complete at home and return for reliability testing. The returned assessments were compared to the participants' original assessments to determine if results were consistent. A percentage was reported that represents the percentage of identical responses on the two MHL-SA1s.

2. *What are the characteristics of participants in the experimental and control groups?*

Frequencies were used to describe the participants' age, race, education level, language, number of pregnancies, and number of classes attended. Chi-square analyses were conducted to determine if there were any significant differences in the characteristics of participants at the control site and the experimental site.

3. *What percentage of participants used BG? What percentage of these participants were satisfied with BG?*

To document participants' use and satisfaction with BG, a descriptive analysis was conducted of the data collected from the experimental group about use and satisfaction. Percentage of participants who used BG was calculated from counts of participants who used BG and total number of participants in the experimental group. Percentage of participants who were satisfied with BG was determined from counts of participants who reported they were satisfied with BG and participants who used BG. Questions from the survey instrument that document these responses can be found in Appendix B.

4. *What are the facilitators' perceptions on supplementing the curriculum with BG?*

Experimental group facilitator interview questions can be found in Appendix C. Interviews were transcribed and coded to determine common themes regarding supplementation and usefulness of BG. Frequencies for common responses will be reported.

5. *Is it feasible to integrate MHL promotion into CP model?*

Facilitators were asked a question about whether or not it was feasible to integrate BG into their sessions. Frequencies of facilitators who reported feasible or infeasible integration were counted and explanations for these answers were reported.

Impact

6. *Does CP increase MHL?*

Variables were converted to binary code and McNemar's test was conducted on participants' pre and post MHL-SA questions for both the experimental and control groups to determine if there was a statistically significant difference pre- and post-CP. Proportions of positive responses pre and posttest (i.e. "sometimes" or "always" choose milk) and the differences in those responses were also reported for each group.

7. *Does Enhanced CP+ (CP+ MHL +BG) promote MHL more than Enhanced CP (CP +MHL)?*

To document the impacts of integrating health literacy promotion into CP with and without BG, the outcome in the intervention group was compared to the outcome in the control group using a Generalized Estimating Equation (GEE) with binomial family and independence working correlation structure and robust standard errors to account for correlated observations by participant. The variables in the model included whether the person was in the intervention or control group and personal characteristics. A regression model was estimated for each dependent variable with the following independent variables: healthcare provider, WIC/food stamps use, ease of finding health information, 800 number or hotline usage, prenatal question to provider, online health info resource use, understanding of pregnancy information, confidence in being good mother, healthy beverage decisions, pregnancy weight goal, prenatal vitamin use,

drug use, alcohol use, tobacco use, exercise, domestic violence recognition, birth control plan, use of stress relief methods, condom use, self-care, teeth brushing frequency.

To estimate the impacts of integrating BG into CP, an interaction term was generated that multiplied the intervention group variable (coded 1=intervention group, 0= control group) by a session variable (coded 1= the record contained the MHL-SA item score at session 10; 0= the record contained the MHL-SA item score at session 2). The interaction term compared the odds of change for the dependent variable in the experimental group versus the odds of change for the dependent variable in the control group; the odds ratio for the interaction term was the estimate of the intervention group's (Enhanced CP+) effect on a dependent variable. For each dependent variable, the regression model was estimated twice, with and without controlling for the age, race/ethnicity, and education level of participants.

Chapter 3: Results

During the pilot period, 129 individuals completed self-assessment #1 and 94 of those completed self-assessment #2 at the control site. At the experimental site, 141 individuals completed self-assessment #1 and 100 of those completed self-assessment #2. In all, there were 171 participants who completed both self-assessment #1 and self-assessment #2; 71 of these were at the control site, and 100 of these were at the experimental site. The 171 participants were included in the analysis to answer evaluation questions #1, 2, 3, 6, and 7.

Interviews were conducted with research coordinators at the experimental and control sites (n=2) and facilitators at the experimental site (n=4) regarding integration of BG into CP. Content analysis of the interview information was performed to answer evaluation questions 4 and 5.

Process

1. Can the MHL-SA be used as a meaningful measure of MHL?

Participants at the control site completed the MHL-SA #1 twice (one month apart) to assess reliability and 13 participants returned the second test. Participants had the same response for the test-retest 83% of the time for all items.

2. What are the characteristics of participants in the experimental and control groups?

Table 1 illustrates the demographic characteristics of participants in the experimental and control groups. There were significant differences between groups for age, race/ethnicity, education level, and language. There were no significant differences between groups for the number of pregnancies and reading frequency.

Table 1. Demographic Characteristics of the Experimental and Control Groups at Baseline (Proportions)

Variable	Total (n=171)	Experimental Group (n=100)	Control Group (n=71)	p-value
Age				
<20	.11	.06	.19	0.00*
20-24	.34	.25	.43	
25-29	.29	.30	.27	
30-34	.17	.23	.09	
> 34	.07	.12	.00	
Race				
White	.68	.82	.50	0.00*
Black	.22	.09	.41	
Hispanic	.05	.04	.06	
Other	.02	.04	.01	
Education Level				
High school graduate	.59	.42	.83	0.00*
No degree	.08	.04	.13	
Enrolled	.02	.02	.02	
Beyond	.29	.51	.00	
Language				
English	.94	.93	.95	0.03*
Spanish	.01	.00	.04	
Other	.00	.00	.00	
Multiple	0.04	0.07	.00	
Number of pregnancies				
1	.56	.53	.61	0.21
2	.22	.20	.25	
3	.12	.17	.06	
4 or more	.08	.09	.06	
Read for fun				
Often	.52	.60	.43	0.47
Sometimes	.35	.30	.43	
Rarely	.08	.08	.09	
Never	.01	.01	.02	

3. What percentage of participants used BG? What percentage of these participants were satisfied with BG?

Table 2 indicates that 63% of participants in the experimental group used BG. Of 63 women who responded to the question "I would recommend *Beginnings Pregnancy*

Guide for others like me", 79% said they would. When asked why, the most frequently cited reasons included "helpful" (20), "good information" (12), "easy to understand" (5), and "good resource for first-time mothers" (3).

Table 2. Experimental Group Follow-Up Survey Results: Use of and Satisfaction with *Beginnings Pregnancy Guides* (BG) (Proportions)

Proportion of Participants Who… (n=100)	
Read BG booklets None 1 or 2 3 or 4 5 or 6	 .37 .23 .21 .19
Used scan code Never 1 time 2+ times	 .93 .07 .00
Used BG more than CP notebook More Less Same Both	 .04 .46 .26 .24
Talked about BG with no one	.42
Talked about BG with group	.20
Talked about BG with partner	.33
Talked about BG with midwife	.01
Talked about BG with friends and family	.13
Would recommend BG	.79
Used clinic's website No Once Sometimes Often	 .39 .13 .34 .15

Have internet access	
No	.02
Computer only	.07
Phone only	.22
Both	.68

4. What are the facilitator's perceptions of supplementing the curriculum with BG?

While facilitators recommend BG to other groups, all facilitators reported that BG did not significantly add to or detract from discussion because BG was so closely aligned with topics the groups were already discussing during CP. They emphasized that BG offered good and important information; three different facilitators particularly mentioned the usefulness of information about the first trimester because they said it is often a period of pregnancy when women, especially first-time mothers, are eager for information. One facilitator stated that opportunities to increase MHL in this period are often underutilized. Several emphasized that the more information, the better, and that any resource or opportunity to increase health literacy should be maximized. One facilitator commented:

> "Well I just think that it [BG] had a lot of helpful information and I think that if patients can improve their health literacy at any point in time during the journey, even when they're not pregnant, it only optimizes their health after. You know, I think it's an incredible skill for patients across the board you know I think as moms we do a great job at advocating for our children but sometimes with our own health literacy… we don't advocate for ourselves as well. So I think it's an important skill to identify and implement and encourage"

Despite positive impressions of BG, research coordinators discussed the issues surrounding the reach of information. Variability of BG content delivered by facilitator

and discussed by the group was mentioned 5 times by both coordinators and how these factors can impact whether or not patients receive the information to improve MHL. One facilitator noted:

> "There is so much variability provider-to-provider, patient-to-patient, and group-to-group. So some groups are incredibly close and do really dynamic stuff in their groups and some groups not really you know. Some groups are so quiet and so not involved that we end their groups early you know so there's so much variability in the implementation of the model so that should be taken into account"

5. Is it feasible to integrate MHL promotion into CP?

Facilitators were asked to rate the ease of BG integration on a scale of 1-5 (with 5 being the easiest). All facilitators rated integration as a 5. When asked why, several mentioned that the BG materials meshed well into topics already being discussed by the groups in their sessions:

> "There was very minimal effort involved in integrating them to me because it did go so seamlessly in what we were talking about anyways. So really it was just more "pick one of these up, there's more information about this, this, and this. You know, look into it if you're interested, let us know if you have any questions" that kind of stuff. So it seemed like an additional resource to be able to offer and certainly we offered that every time we had the chance to do it"

<u>Impact</u>

6. Does CP promote MHL?

Table 3 presents the differences pre- and post-CP for the experimental and control sites. Of the 29 variables tested in the MHL-SA instrument, 5 in the experimental group (food stamps, DV=how to act, DV=check up on, birth control plan, and ask for help) were statistically significant in the expected direction with p-values <0.05. Three of these five measures were in the health promotion domain. One variable in the control group (DV=how to act) was statistically significant in the expected direction with a p-value of 0.00.

Both groups displayed significant changes pre- and post-CP regarding recognition of the signs of domestic violence. Some of the more subtle signs of domestic violence, such as being checked up on constantly or being told how to act, had significant changes, signifying that knowledge transmitted during CP groups led to increased recognition of these behaviors

Table 3. Differences Pre- and Post-CP for Experimental and Control Groups: McNemar's Test Results

Table 3a. Disease Treatment and Healthcare

	Experimental Group (n=100)				**Control Group (n=71)**			
Variable	**Pretest**	**Posttest**	**Difference**	**p-value**	**Pretest**	**Posttest**	**Difference**	**p-value**
Healthcare provider	.57	.62	.04	.26	.50	.50	-.00	1.00
WIC or food stamps	.55	.65	.10	.00*	.88	.93	.05	.22
Easy to find info	1.00	1.00	0.00	1.00	.97	.97	.00	1.00
Call 800 number	.07	.03	-.04	.21	.16	.08	-.07	.23
Find health info online	.89	.86	-.03	.28	.88	.80	-.07	.23
Ask provider question	.93	.96	.02	.37	.89	.95	.06	.29

Easy to understand pregnancy info	.98	1.00	.01	1.00	.94	.98	.04	.38
Confidence	1.00	1.00	.00	1.00	.95	.98	.03	.50

* Indicates p-value <0.05

Table 3b. Disease Prevention and Health Protection

	Experimental Group (n=100)				**Control Group** (n=71)			
Variable	**Pretest**	**Posttest**	**Difference**	**p-value**	**Pretest**	**Posttest**	**Difference**	**p-value**
Choose Milk	.80	.74	-.05	.15	.69	.70	.01	1.00
Set Weight Goal	.37	.35	-.01	1.00	.43	.34	-.08	.42
Take Prenatal Vitamins	.88	.88	.00	1.00	.95	.86	-.08	.07
Drug Free	.95	.96	.01	1.00	.98	.98	.00	1.00
Alcohol Free	.98	.98	.00	1.00	.96	1.00	.03	.50
Tobacco Free	.87	.91	.04	.34	.84	.88	.03	.69

* Indicates p-value <0.05

Table 3c. Health Promotion

	Experimental Group (n=100)				**Control Group (n=71)**			
Variable	**Pretest**	**Posttest**	**Difference**	**p-value**	**Pretest**	**Posttest**	**Difference**	**p-value**
Exercise	.35	.39	.03	.61	.35	.35	.00	1.00
DV= being hit	.81	.79	-.02	.82	1.00	.98	-.01	1.00
DV= seeing friends	.12	.11	0.01	1.00	.02	.05	.02	.69
DV= financial decisions	.09	.09	.00	1.00	.01	.08	.07	.12
DV= how to act	.59	.72	.13	.04*	.44	.76	.31	.00*
DV= forced	.80	.76	-.04	.48	.83	.85	.02	1.00

sex								
DV= checked up on	.31	.52	0.2122	.00*	.23	.33	.09	.15
Birth control plan	.74	.82	.08	.04*	.83	.88	.05	.45
Practice stress relief	.73	.75	.02	.86	.64	.75	.10	.21
Ask for partner to use condom	.13	.18	.05	.12	.23	.29	.05	.34
Feel sad, get rest	.78	.79	.01	1.00	.86	.79	-.06	.33
Feel sad, go to ER	.00	.01	.01	1.00	.00	.01	-.01	1.00
Feel sad, ask for help	.49	.64	.15	.01*	.29	.29	.00	1.00
Feel sad, call provider	.14	.13	-.01	1.00	.09	.10	.01	1.00
Brush teeth	.84	.86	.02	.77	.89	.89	.00	1.00

* Indicates p-value <0.05

7. Does Enhanced CP+ (CP+ MHL +BG) promote MHL more than Enhanced CP (CP +MHL)?

Table 4 displays the odds ratios that describe the odds of change for the dependent variable in the experimental group versus the odds of change for the dependent variable in the control group both controlling and not controlling for covariates. Results were similar for both models. For 13 of the MHL variables, the change was statistically significant between groups. Seven of these significant odds ratios favored the experimental group, and six of these significant odds ratios favored the control group. Of the seven odds ratios that favored the experimental group, five were in the expected direction. Of the six odds ratios that favored the control group, four were in the expected direction.

Table 4. Odds Ratios Describing the Change between Experimental and Control Groups Pre-and Post-CenteringPregnancy: GEE Analysis Results

Table 4a. Disease Treatment and Healthcare

MHL Variable	Odds Ratio (Without covariates)	Odds Ratio (With covariates)
Healthcare provider	1.46 (0.83-2.56)	1.57 (.90- 2.76)
WIC or food stamps	0.62*** (0.24-1.58)	0.71*** (.25- 2.03)
Call 800 number	0.51* (0.14-1.84)	0.49* (.12- 1.94)
Find health info online	0.51 (0.21-2.11)	0.65* (.20-2.19)
Ask provider question	2.87 (0.30-27.15)	2.80* (.26- 30.09)

* Indicates p-value <0.05
** Indicates p-value <0.01
*** Indicates p-value <0.001

Table 4b. Disease Prevention and Health Protection

MHL Variable	Odds Ratio (Without covariates)	Odds Ratio (With covariates)
Choose Milk	1.13 (0.53-2.38)	1.10 (.51- 2.38)
Set Weight Goal	1.28 (0.72-2.25)	1.35 (.74- 2.48)
Take Prenatal Vitamins	2.64 (1.04-6.72)	2.98 (1.09- 8.14)
Drug Free	1.23 (0.49-3.10)	1.30 (.53- 3.22)
Alcohol Free	0.13*** (0.04-0.46)	0.11*** (.03- .39)
Tobacco Free	1.12 (0.50-2.52)	1.20 (.55- 2.63)

* Indicates p-value <0.05
** Indicates p-value <0.01
*** Indicates p-value <0.001

Table 4c. Health Promotion

MHL Variable	Odds Ratio (Without covariates)	Odds Ratio (With covariates)
Exercise	1.20 (0.61-2.31)	1.27 (.65-2.50)
DV= being hit	8.92*** (2.63-30.22)	8.50*** (2.43-29.75)
DV= seeing friends	2.14 (0.17-26.41)	1.95 (.18-21.19)
DV= financial decisions	1.01 (0.08-12.78)	0.96 (.08- 11.31)
DV= how to act	0.83*** (0.34-2.02)	0.85*** (.35-2.11)
DV= forced sex	0.95 (0.46-1.96)	0.99 (.48- 2.07)
DV= checked up on	2.20*** (1.11-4.39)	2.40*** (1.19-4.85)
Birth control plan	1.09 (0.55-2.18)	1.24** (.61-2.55)
Practice stress relief	0.71 (0.32-1.60)	0.68* (.29-1.58)
Ask for partner to use condom	1.34 (0.68-2.62)	1.58* (.75-3.34)
Feel sad, get rest	2.16 (0.79-5.90)	2.14 (.78-5.89)
Feel sad, ask for help	1.20*** (0.53-2.73)	1.29*** (53-3.15)
Feel sad, call provider	0.91 (0.29-2.85)	1.10* (.34-3.57)
Brush teeth	2.11 (0.74-6.01)	2.22 (.73- 6.82)

* Indicates p-value <0.05
** Indicates p-value <0.01
*** Indicates p-value <0.001

Chapter 4: Discussion

Results of this study helped to assess the reliability of the maternal health literacy self-assessment, document the feasibility and impacts of integrating MHL promotion into CP with and without BG, and document participants' overall use and satisfaction with BG.

The test-retest of the MHL-SA suggests that the MHL-SA instrument is fairly reliable. However, these results are limited due to the small number of participants at the control site (n=13) who returned the second MHL-SA1. The original protocol called for all participants at the control site to return the second MHL-SA1, however only 13 of the original 128 participants who filled out the first MHL-SA1 did. Future studies should follow-up with non-respondents to achieve a higher response rate. The instrument demonstrates a degree of face and construct validity since the questions are based on the key messages defined by the official prenatal care guidelines.

Results from McNemar's test demonstrate that CP may contribute to increased recognition of more subtle signs of domestic violence, like being told how to act or being checked up on constantly. However, for many of the variables, changes pre-and post-CP were relatively small: participants often had relatively high MHL knowledge at pretest, which naturally had less room to improve at posttest.

The GEE regression results indicate that MHL outcomes improved in both the experimental and control groups, with and without controlling for covariates. Because significant odds ratios were evenly divided between groups, this result suggests that any beneficial change in a MHL item may not be attributable to BG. Therefore, CP promotes MHL by itself. Furthermore, even though the analysis controlled for

covariates, there were only small differences in odds ratios with and without the inclusion of race and ethnicity, age, and education. This pattern indicates that even if participants understood and acted on information received in BG materials, such behavior was not strongly influenced by these personal characteristics. For the characteristic of education level, this result supports previous research that MHL is not dependent on, and can be developed without the presence of, functional or health-related literacy (Smith, 2009).

Overall, utilization of BG was relatively low. About 63% of participants utilized the BG booklets at least once, with only 19% reading all or most of the books. Pre-and post-CP MHL measures of the 63 participants who used the booklets were also examined separately. These changes were not significantly different from the pre-and post-changes of the experimental group as a whole. These results may be indicative of the way the booklets were introduced to the groups: many of the facilitators referred to BG as an additional resource for mothers who wanted more information. Almost half of participants noted that they used BG less than the CP workbook; thus, the CP workbook seemed to be the preferred source of information because it was referenced to more during CP sessions, which may have further contributed to non-use of BG.

The unexpected lack of results of MHL promotion integration with and without BG may be due to implementation variability, which was stressed in facilitator and research coordinator interviews. Implementation of CP is different from group-to-group, such as differences in actual content delivered, timing of delivery, teaching strategy of the facilitator, and group climate and dynamics (Thielen, 2012). These differences may factor into the low number of significant differences for MHL measures pre- and post-CP

in both groups. While the demonstration project aimed to evaluate the feasibility and benefits of integrating into the usual activities of CP, it is difficult to measure impact without taking these considerations into account. The results could have potentially been more conclusive with greater standardization of these categories; however, that is often not possible in programs as discussion-based and participant-led as CP. Lack of protocol fidelity is both a strength and a limitation for MHL promotion. This also may have made it more difficult to strongly incorporate BG because sessions are so loosely structured. Based on the qualitative results, it would be beneficial to repeat the intervention and assure that the intervention group is exposed to BG. To truly test whether Enhanced CP+ works to promote MHL, the participants must be exposed to BG consistently across sessions.

Several limitations of the study deserve mention, primarily in the data collection and the measurement instrument itself. There was significant loss to follow-up for the completion of the MHL-SA2 at the last visit. The personal characteristics of participants were significantly different in the intervention and control groups, which may have influenced estimates of intervention effects. There were also instrumentation threats to internal validity for several MHL questions measuring behaviors. While the questions on MHL-SA1 were phrased to measure health hypothetical knowledge for several of the questions (i.e. would you call the ER if you were in a minor accident), the questions on MHL-SA2 were phrased to measure actual health behavior (i.e. did you call the ER if you were in an accident during this pregnancy). Therefore, results for the MHL behavior items may be due to differences in the items between the pre- and post-test rather than the intervention itself. In addition, intervention effects were estimated by examining each

item in the MHL-SA. Future studies should develop a composite measure for each domain, as well as an overall composite score for all items in the scale, to estimate the impact of Enhanced CP+ on MHL as a whole.

The results of this evaluation are important to further the knowledge of integration of MHL into various programs hypothesized to promote it. Prenatal care represents an opportune time to improve MHL; therefore, the effects of such programs on MHL during this time period should be studied further. Implementation studies are needed to improve our understanding how MHL is promoted through facilitator teaching style or whether the BG content is delivered with fidelity. This evaluation demonstrates that CP has the potential to positively impact MHL, without significant dependence on participant characteristics of age, race and ethnicity, or education level, in the health promotion domain.

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Appendix

Appendix A. Maternal Health Literacy Self-Assessment

Section 1: Thinking about yourself

1. Today's Date is _____.
2. My age is ___ years.
3. My race/ethnicity is ____.
4. The language(s) I speak at home is/are ____.

Section 2:

Check items that are true for you today.

5. Today's Date is _____.
6. My age is ___ years.
7. My race/ethnicity is ____.
8. The language(s) I speak at home is/are ____.
9. [] I have completed high school or a GED
   [] I have not completed high school or a GED
   [] I am in high school or working on my GED now
10. I read for fun or read to a child
    [] Often [] Sometimes [] Rarely [] Never
11. This pregnancy is my
    [] First [] Second [] Third [] More
12. I go to CenteringPregnancy at _____.
13. My group started in
    [] Jan [] Feb [] Mar [] Apr [] May [] June [] July [] Aug [] Sept [] Oct [] Nov [] Dec
    Of 20__.
14. Today's session is Session # []2 [] 3 [] 4 []5 []6 []7 []8 [] 9 []10
15. Counting today, the number of CenteringPregnancy Sessions I have attended is
    [] 1 []2 []3 []4 []5 []6 []7 []8 []9 []10

Section 3: Thinking about nutrition & weight management

Check the items that are true for you today.

16. I choose to drink milk or water instead of soda pop or sweet tea.
    [] Always [] Usually [] Sometimes [] Never
17. [] I have set a weight goal for my pregnancy
    [] I have not set a weight goal.
18. I take prenatal vitamins.
    [] Every day [] Most days [] Some days [] Never

Section 4: Thinking about drugs and alcohol

Check answers that are true for you now.

19. [] I am drug free
    [] I use drugs
    [] I cut back for pregnancy
    [] I am in a treatment program

20. [] I am alcohol free
    [] I drink alcohol
    [] I cut back for pregnancy
    [] I go to AA group
21. [] I am smoke free
    [] I use tobacco
    [] I cut back for pregnancy
    [] I go to quit classes

Section 5: Thinking about self-care:

Check answers that are true for you today.

22. I exercise at least 30 minutes
    [] Everyday [] Most days [] Some days [] Never
23. I would call my prenatal provider if:
    [] I had blood leaking from my vagina
    [] I had heartburn
    [] I was in a minor accident
    [] I feel something is wrong
    [] My back is sore
    [] I lose weight
24. I would go to the nearest hospital emergency room if:
    [] Anyone hits or kicks or sexually assaults me
    [] I have leg cramps
    [] I have pain when I go to the bathroom
    [] I feel short of breath
    [] I have a fever of 100.6 that does not go away after I take Tylenol
    [] I have constipation
25. Domestic violence (abuse) includes:
    [] Being hit or beaten
    [] Seeing family and friends when you choose
    [] Having a say in financial decisions
    [] Being told how to act
    [] Having your partner continually check up on you
    [] Being forced to have sex when you don't want to
26. [] I plan to use birth control after my baby is born
    [] I have not thought about family planning
27. I practice deep breathing or other stress relief method
    [] Everyday [] Some days [] Most days [] Never
28. I ask my partner to use a condom
    [] Always [] Usually [] Sometimes [] Never
29. If I feel sad and cry often for no reason for a few days, I will
    [] Get extra rest [] Go to a hospital emergency room
    [] Ask for help with daily tasks [] Call my healthcare provider
30. I brush my teeth twice a day
    [] Everyday [] Most days [] Some days [] Never

Section 6: Thinking about healthcare & community resources:

31. I have a healthcare provider that I go to when I am not pregnant.
    Yes/ No/I go to the emergency room when I want to see a doctor
32. I use WIC or food stamps when I need to
    [] Yes [] No [] I'm never short of food

Section 7: Thinking about finding and using information for health:

33. How easy or difficult is it to find information you need to keep yourself healthy?
    [] Very easy [] Easy [] Difficult [] Very difficult
34. I have called an 800 number or a hotline for help or information
    [] Yes [] No, never
35. I have asked my prenatal care provider a question about pregnancy
    [] Yes [] No
36. I have found health information online.
    [] Yes [] No, never
37. How easy or difficult is it to understand information about pregnancy and birth?
    [] Very easy [] Easy [] Difficult [] Very difficult
38. How confident do you feel today about being a good mother?
    [] Very [] Somewhat [] A little [] Not at all confident

Appendix B. Intervention Group Survey Questions

Thinking about *Beginnings Pregnancy Guides:*

Check answers that are true for you today and fill in the blanks.

1. I read the *Beginnings Pregnancy Guide* booklets
   [] No, none [] 1 or 2 [] 3 or 4 [] 5 or 6
2. I used the scan code to find more information online
   [] Never [] 1 time [] 2+ times
3. The most helpful resource I found was _____.
4. Compared to the Centering notebook, I used *Beginnings Pregnancy Guide*
   [] more [] less [] about the same [] I was glad to have both
5. I talked about something I read in *Beginnings Pregnancy Guide* with
   [] No one [] my Centering group [] my partner [] my midwife
   [] friends/family
6. I would recommend *Beginnings Pregnancy Guide* for others like me
   [] No, because _____.
   [] Yes, because _____.
7. I used the MAHEC website
   [] No [] Once [] Sometimes [] Often
8. I have internet access
   [] No [] On a computer [] On a phone
9. Something I'd like you to know is _____.

Appendix C. Semi-structured Interview Questions

Control group coordinator
Did you encounter any difficulties administering the survey?
Did mothers have any trouble understanding the questions?
Were there any problems with the survey itself?
Were there any changes in the protocol?
What else do you wish I would ask you?

Experimental group coordinator
Were there any problems with the survey itself?
Were there any changes in protocol?
How did you integrate BG?
Rate the ease of integrating BG into program on a scale of 1-5.
What would you do differently?
What is your impression of how this changed the program (or not)?
What comments did you receive from facilitators about BG?
Would you recommend BG to other programs?
What would you say to other CP programs that are considering integrating BG?
What do you want the research team to know?
What would you say to Anthem-WellPoint Insurance Co?

Experimental group facilitators
Did you find it necessary or beneficial to change the protocol? (if yes, what did you change? why? how well did that work?
How helpful were the "cheat sheets"?
Rate the ease of integrating BG into your sessions on a scale of 1-5.
How Did BG change the discussion? Can you give an example?
Did you introduce about all the books to your groups? (If no, which ones left out? why?)
What would you do differently to integrate?
Would you want to continue using BG in your groups?
Can you name a favorite BG page or topic?
What do you want the research team to know?
What would you say to Anthem-WellPoint Insurance Co?