Predicting Breast-Feeding Intention Among Low-Income Pregnant Women: A Comparison of Two Theoretical Models

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This study examined the applicability of the transtheoretical model and a model derived from the theory of reasoned action for predicting breast-feeding intention among low-income pregnant women. Participants completed a 70-item self-report questionnaire assessing their breast-feeding attitudes, intentions, and support. A positive correlation existed between Stages of Change for breast-feeding and the number of Processes of Change used by respondents. A negative correlation existed between Stages of Change for breast-feeding and the number of negative breast-feeding beliefs held by respondents. Furthermore, women's normative beliefs and outcome beliefs were significantly correlated with breast-feeding intention in manners consistent with the model developed from the theory of reasoned action. After accounting for significant sociodemographic and lifestyle factors, the Processes of Change and outcome beliefs remained independently correlated with breast-feeding intention. These models are capable of predicting the intention to breast-feed and might offer an innovative approach for further breast-feeding research and intervention development.

The research literature extensively documents the numerous benefits of breast-feeding.[1,2] Moreover, national goals exist for increasing breast-feeding rates in the United States.[3] Despite the wealth of evidence supporting the benefits of breast-feeding and delineating the hazards of artificial infant feeding methods,[2] breast-feeding rates today continue to remain below recommended levels in the United States, most notably among low-income and minority women.[4,5]

Extensive research findings are available concerning barriers to breast-feeding, correlates of breast-feeding, and factors influencing breast-feeding. However, researchers infrequently examine breast-feeding intention and its behavioral determinants. Much of contemporary breast-feeding research also lacks a behaviorally oriented theoretical foundation. Furthermore, breast-feeding educators tend to insufficiently use public health

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behavior change theories in the development of breast-feeding educational strategies. This general absence of a theoretical basis to breast-feeding research and intervention development might be undermining efforts to improve breast-feeding rates. Applying theoretical frameworks to understanding breast-feeding intention might suggest new approaches to breast-feeding education and promotion.

Conceptual Framework

Prior to this study, no other research existed documenting application of the transtheoretical model constructs to understanding breast-feeding intention. However, research demonstrates that this behavioral model can be successfully used to explain and influence many other positive and negative health behaviors, most notably smoking cessation.[6]

The model contains three elements: Stages of Change, Processes of Change, and Decisional Balance.[7] The Stages of Change (precontemplation, contemplation, preparation, action, and maintenance) represent readiness for change. The Processes of Change consist of 10 methods for moving through the Stages of Change: consciousness raising, self-reevaluation, self-liberation, counterconditioning, stimulus control, reinforcement management, helping relationships, dramatic relief, environmental reevaluation, and social liberation.[6,7] Use of the processes varies according to stage, thus providing inherent intervention strategy guidelines to promote movement of individuals between stages.[7] Individuals in precontemplation, for example, use all 10 Processes of Change less frequently than do individuals in other stages.[6] Finally, the Decisional Balance construct analyzes the costs and benefits of behavior change. A belief pattern of high cons (costs) and low pros (benefits) toward the behavior change is associated with precontemplation. Conversely, a consecutive pattern of lower cons and higher pros coincides with latter stages.[7]

This study also employed a model (hereafter called the modified reasoned action model) developed from Ajzen and Fishbein's theory of reasoned action,[8] which proposes that actual behavior is determined by *behavioral intention*. Normative and attitudinal factors are posited to directly influence behavioral intention, according to this theory.[9] Researchers have successfully used the theory of reasoned action to explain, predict, and modify many health behaviors including breast-feeding intention, initiation, and duration.[10-13]

However, beyond these few studies, researchers still lack much information on the theory and breast-feeding. For example, the just-mentioned breast-feeding studies relied on samples that were primarily Caucasian, middle income, educated, and married. None of the studies included women prior to 24 weeks gestation, although Manstead, Proffitt, and Smart[11] detected no evidence that the length of time between assessment of attitudes and intentions and the assessment of behavior influenced the impact of attitudes and intentions on actual behavior. Moreover, Quarles et al.[12] omitted both the normative and attitudinal constructs from their study and did not control for the significant demographic differences positively associated with breast-feeding between the two samples examined (e.g., older maternal age, higher education, higher income), and this likely influenced their results.

Study Objectives and Hypotheses

Study objectives included (a) examining breast-feeding intention through the constructs of the transtheoretical model and another model, the modified reasoned action model, developed from the theory of reasoned action; (b) determining the applicability of

these constructs for predicting breast-feeding intention; (c) differentiating which of the two models is more predictive of breast-feeding intention; and (d) providing an alternative theoretical approach to breast-feeding research to help improve and expand the variety of techniques used to formulate breast-feeding educational strategies. Specific research hypotheses for the transtheoretical model were as follows:

Hypothesis 1: The Stages of Change construct for breast-feeding is positively correlated with the number of positive breast-feeding beliefs (pros) and is negatively correlated with the number of negative breast-feeding beliefs (cons) held by respondents, as assessed by the Decisional Balance construct of the transtheoretical model.

Hypothesis 2: Respondents in precontemplation use significantly fewer Processes of Change than do respondents in latter Stages of Change for breast-feeding.

The study hypothesis for the modified reasoned action model was as follows:

Hypothesis 3: There is a positive correlation between breast-feeding intention and the normative beliefs and outcome beliefs constructs as assessed by the model.

An additional exploratory hypothesis was as follows:

Hypothesis 4: The constructs from both models independently contribute to the prediction of breast-feeding intention and Stages of Change for breast-feeding.

METHOD

Study Participants

The study took place in the Maternal and Child Health Nutrition Department of the Grady Health System in Atlanta, Georgia, during October and November 1995. Study participants were a convenience sample of 1,001 low-income, primarily minority pregnant women. Each woman completed a six-page, 70-item, self-report instrument including demographic information as well as information concerning breast-feeding attitudes, beliefs, social support, and past and intended future behaviors.[14] Table 1 describes the sample characteristics.

Variables

Investigators measured the five Stages of Change for breast-feeding of the transtheoretical model by respondents' selection of one of five statements concerning their future infant feeding plans (precontemplation = planning to exclusively formula-feed; contemplation = considering breast-feeding but not certain about it; preparation = planning to breast-feed but not sure for how long; action = planning to breast-feed for 1-5 months; maintenance = planning to breast-feed for at least 6 months). Each stage was assigned a number (scale = 1-5) representing, in sequential order, precontemplation (1) through maintenance (5).

Table 1. Sample Characteristics

Characteristic	Percentage	*n*
Maternal age (years, *N* = 986)		
13-19	30.5	301
20-29	52.2	515
30-39	16.2	160
40-49	1.0	10
Education (highest level achieved, *N* = 944)		
Did not complete high school	36.7	346
Completed high school only	37.0	349
Completed some college	20.1	190
Completed college	6.3	59
Prenatal care onset (months gestation, *N* = 965)		
≤ 1 month	32.6	315
2-4 months	50.9	491
≥ 5 months	11.7	113
No prenatal care	4.8	46
Marital status (*N* = 952)		
Single	76.5	728
Married	23.5	224
Ethnic origin (*N* = 982)		
African American	80.2	788
Hispanic	14.2	139
Caucasian	3.1	30
Other race	2.5	25
Parity (*N* = 963)		
First pregnancy	38.1	367
Second pregnancy	21.9	211
Third pregnancy	20.6	198
Fourth or greater pregnancy	19.4	187
Gestational age (*N* = 953)		
First trimester (Weeks 1-13)	27.0	257
Second trimester (Weeks 14-26)	31.5	300
Third trimester (Weeks ≥ 27)	41.6	396
WIC program status (*N* = 888)		
Enrolled in the WIC program (or enrolling today)	82.5	733
Not in WIC program (and not enrolling today)	17.5	155
Medicaid status (*N* = 965)		
Medicaid recipient	77.4	747
Not receiving Medicaid	22.6	218

NOTE: WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.

The Processes of Change variable total score (0-10) included women's responses to 20 statements measured on a 5-point Likert scale. Higher total scores reflected participants' use of a greater number of processes, which is consistent with participants being in latter Stages of Change.[6] Two statements represented each of the 10 processes, and the selection of *agree* or *strongly agree* in response to either statement constituted use of that particular process. For example, "Others will be proud of me if I breast-feed" and "I will be

happy with myself if I breast-feed" represented the reinforcement management process.[14] The sample mean (± *SD*) Processes of Change score was 6.8 ± 2.2 (range = 0 to 10, *n* = 924). Cronbach's coefficient alpha (α) for the processes scale was 0.83.[14]

The Decisional Balance variable total score (–40 to 40) reflected the sum of women's responses to 20 positive and negative breast-feeding statements, each measured on a 5-point Likert scale (range = –2 to 2). The sample mean Decisional Balance score was 12.1 ± 9.5 (range = –13 to 40, *n* = 770). Negative scores demonstrated overall negative breast-feeding beliefs. "Breast-feeding is the healthiest feeding for a baby" and "Breast-feeding makes your breasts sag" were two of the scale items (scale α = 0.79).[14] The Decisional Balance pro scale and con scale scores (0 to 20) represented assessments of the total numbers of positive and negative breast-feeding attitudes, respectively, held by women. The pro and con scale scores were based on the 20 Decisional Balance breast-feeding statements that had their scales recoded to 0 (*disagreement or uncertainty about the attitude*) and 1 (*agreement with the attitude*). Scores were reversed on 10 items in each scale depending on whether the pro or con scale was being assessed.

The authors defined breast-feeding intention from the modified reasoned action model as *not planning to breast-feed* (0) versus *planning to breast-feed* (1). The outcome beliefs variable total score (–200 to 200) represented beliefs about perceived positive and negative consequences of breast-feeding and an evaluation of the importance of those outcomes. The outcome score was the sum of women's responses to 20 attitudinal statements (–2 = *strongly disagree* through 2 = *strongly agree*). Outcomes considered by women to be "important" had their scores multiplied by 5 (i.e., new scale = –10 to 10 for each attitude). Participants' outcome scores ranged from –51 to 140, with a mean score of 33.1 ± 30.8, $t = 29.46$, $n = 753$, $p < 0.00001$). More negative scores reflected increasingly stronger negative perceptions of breast-feeding and its outcomes. Scale items included statements such as "Breast-feeding is good for me" and "Breast-feeding means that I can't go back to work or school" (scale α = 0.79).[14]

The normative beliefs construct total score (5 to 625) incorporated the importance of five significant others (e.g., "My mother is a very important person to me"), respondents' perceptions of the significant others' breast-feeding beliefs (e.g., "My mother wants me to breast-feed"), and respondents' likelihood of compliance with the significant others' attitudes (e.g., "I usually follow my mother's advice").[14] Responses to each of the 15 statements were coded on a 5-point Likert scale (1 = *strongly disagree* through 5 = *strongly agree*). The three scores representing each significant other were then multiplied together and added to the scores of the four other significant others. Higher total scores reflected greater perceived social support for breast-feeding. There were a total of five significant others whose perceived infant feeding beliefs were examined in the study, and all five of their mean beliefs scores were significantly correlated with women's actual perceived infant feeding plans (data not shown). The sample mean normative beliefs score was 260.0 ± 86.8 (range = 18 to 575, *n* = 914, scale α = 0.67).[14]

Operationalization of the modified reasoned action model constructs was founded on the theory of reasoned action framework.[8] The authors adopted a less strictly defined approach to operationalizing the variables, although the measures used are logical and generally conform to Ajzen and Fishbein's[8,9] guidelines and are consistent with measures used by other researchers.[9-13]

The attitudes toward the behavior construct of the theory of reasoned action traditionally are measured directly using bipolar evaluative scales.[9] The outcome beliefs variable was our alternative to the traditional attitudinal construct. The outcome variable more

closely describes what women perceive to be the positive and negative consequences or outcomes of breast-feeding and the importance of those outcomes. Rather than being measured directly, this variable was measured as the sum of cross-products of a set of potential outcomes. Our variable also differs from the theory's outcome beliefs construct[9] in that our variable was composed of the product of importance and agree/disagree dimensions as opposed to the more traditional likelihood of the outcome's occurrence and good/bad dimensions.

The subjective norms construct of the theory of reasoned action traditionally is measured using a single item that assesses what the participant believes that most people important to her want her to do.[8,9] Measurement of referent norms and motivation to comply with each referent also is included separately in the theory. Our normative beliefs variable is, in essence, a combination of the theory's subjective norms and referent/motivation measurements.

The study used the Epi Info statistical software package for data analyses (Version 6.02, Centers for Disease Control and Prevention, Atlanta, GA). Another publication reviewed further details of the study methodology, instrument content, and instrument reliability.[14]

RESULTS

Hypothesis 1

The sample distribution among the Stages of Change for breast-feeding was as follows: precontemplation, 23.4%; contemplation, 26.1%; preparation, 24.4%; action, 6.6%; maintenance, 19.6% (n = 971). Positive correlations were found between the Stages of Change for breast-feeding and (a) the number of positive breast-feeding beliefs held by respondents according to the Decisional Balance pro scale, $r = 0.45$, $r^2 = 0.20$, $F(1, 755) = 191.86$, $p < 0.01$, and (b) the total Decisional Balance score that incorporated both the number of positive and negative breast-feeding beliefs held by respondents, $r = 0.48$, $r^2 = 0.23$, $F(1, 755) = 229.49$, $p < 0.01$. Findings also demonstrated a negative correlation between Stages of Change for breast-feeding and the number of negative breast-feeding beliefs held by respondents according to the Decisional Balance con scale, $r = –0.32$, $r^2 = 0.10$, $F(1, 755) = 85.04$, $p < 0.01$. Table 2 shows the distribution of the mean number of breast-feeding beliefs according to women's stages.

Hypothesis 2

There was a statistically significant positive correlation between Stages of Change for breast-feeding and the number of Processes of Change used by study participants, $r = 0.51$, $r^2 = 0.26$, $F(1, 899) = 310.15$, $p < 0.01$. As presented in Table 2, respondents in precontemplation used an average of 5.1 Processes of Change, whereas respondents in latter stages used an average of 7.4 Processes of Change.

Table 3 displays regression model results for the transtheoretical model constructs predicting Stages of Change for breast-feeding using standard multiple linear regression analysis, multiple $R = 0.62$, multiple $R^2 = 0.38$, $F(2, 722) = 223.81$, $p < 0.01$. Both model constructs significantly and independently contributed to the prediction of women's stages.

Table 2. Distribution of the Mean Number of Positive (pro scale) and Negative (con scale) Beliefs About Breast-Feeding, the Mean Total Decisional Balance Scores, and the Mean Number of Processes of Change Used According to Respondents' Stages of Change for Breast-Feeding

Stage of Change	Mean Number of Pros[a]	Mean Number of Cons[b]	Mean Decisional Balance Score[c]	Mean Number of Processes of Change[d]
Precontemplation	8.9	5.0	5.4	5.1
Contemplation	10.9	3.8	10.3	6.4
Preparation	12.7	3.3	14.5	7.5
Action	12.8	3.4	14.8	7.2
Maintenance	14.0	2.7	18.8	8.5

NOTE: ANOVA = analysis of variance.
a. Scale = 0 to 20 total possible, mean score = 11.6 ± 3.9, range = 0 to 20, n = 770, ANOVA: $F(4, 752) = 53.42$, $p < 0.000001$.
b. Scale = 0 to 20 total possible, mean score = 3.7 ± 2.4, range = 0 to 12, n = 770, ANOVA: $F(4, 752) = 91.15$, $p < 0.000001$.
c. Scale = –40 to 40 total possible, mean score = 12.1 ± 9.5, $t = 35.28$, n = 770, $p < 0.00001$, range = –13 to 40, n = 770, ANOVA: $F(4, 752) = 53.42$, $p < 0.000001$.
d. Scale = 0 to 10 total possible, mean score = 6.8 ± 2.2, range = 0 to 10, n = 924, ANOVA: $F(1, 899) = 200.37$, $p < 0.000001$.

Table 3. Multiple Regression of the Transtheoretical Model Constructs on the Stages of Change for Breast-Feeding and of the Modified Reasoned Action Model Constructs on Breast-Feeding Intention

	Beta Coefficient	Partial F Test	p Value	sr^{2} [a]
Variable[b]				
Processes of Change	.2786473	175.5949	< 0.01	.15
Decisional Balance	.0423524	74.1586	< 0.01	.06
Variable[c]				
Outcome beliefs	.0067489	139.1477	< 0.01	.15
Normative beliefs	.0009456	20.4017	< 0.01	.02

a. Squared semi-partial correlation; unique contribution of each variable to the R^2.
b. Regression of transtheoretical model constructs to predict Stages of Change for breast-feeding variable, multiple $R = 0.62$, multiple $R^2 = 0.38$, $F(2, 722) = 223.81$, $p < 0.01$.
c. Regression of the modified reasoned action model constructs to predict breast-feeding intention variable, multiple $R = 0.48$, multiple $R^2 = 0.23$, $F(2, 695) = 105.98$, $p < 0.01$.

Hypothesis 3

Women intending to breast-feed composed 50.6% of the sample (n = 971). There was a positive correlation between breast-feeding intention and the total normative beliefs score as assessed by the modified reasoned action model, $r = 0.26$, $r^2 = 0.07$, $F(1, 894) = 64.67$, $p < 0.01$. Women not intending to breast-feed had a mean normative beliefs score

of 237.9, whereas women planning to breast-feed had a higher mean score of 283.0, analysis of variance (ANOVA): $F(1, 894) = 64.67$, $p < 0.000001$. Findings demonstrated that women's mothers overall were the most influential of the significant others examined, followed by the women's doctors and then the babies' fathers (data not shown).

A positive correlation also was found between breast-feeding intention and the outcome beliefs construct of the modified reasoned action model, $r = 0.47$, $r^2 = 0.22$, $F(1, 741) = 209.81$, $p < 0.01$. Approximately 14% of respondents had overall negative attitudes toward breast-feeding. Women not planning to breast-feed had a mean outcome score of 18.6, whereas women planning to breast-feed had a higher mean score of 47.5, Kruskal-Wallis $H(1, 741) = 168.59$, $p < 0.000001$.

Table 3 displays the standard multiple linear regression analysis findings using the modified reasoned action model constructs to predict breast-feeding intention, multiple $R = 0.48$, multiple $R^2 = 0.23$, $F(2, 695) = 105.98$, $p < 0.01$. Both the normative and outcome beliefs variables provided significant unique contributions to the prediction of breast-feeding intention.

Hypothesis 4

In an effort to identify which constructs and/or which model might be more relevant for developing breast-feeding educational strategies, regression analyses were conducted to determine which specific constructs from the two models, and which of the two models overall, were more predictive of breast-feeding intention and Stages of Change for breast-feeding. Table 4 (Part A) presents the multiple regression results predicting breast-feeding intention from the demographic variables alone and from the theoretical and demographic variables combined. The final regression equation excluded the transtheoretical model's Decisional Balance variable because it measured virtually the same information and partially used the same scale as the modified reasoned action model variable outcome beliefs. The prediction equations excluded the following demographic variables because they did not significantly contribute to the regressions: age, marital status, Medicaid enrollment status, Hispanic or Caucasian ethnicity, parity, and gestational age at prenatal care onset.

The transtheoretical model's Processes of Change construct was the strongest correlate of breast-feeding intention, followed by the outcome beliefs construct and then women's amount of prior breast-feeding experience, $sr^2 = 0.02$, partial $F = 15.92$, $p < 0.01$. The modified reasoned action model did not uniquely contribute to the previous prediction equation beyond the contribution provided by the transtheoretical model. The transtheoretical model, therefore, was the stronger predictor of breast-feeding intention.

The study predicted women's Stages of Change for breast-feeding using the theoretical constructs and demographics (adding parity) in the same fashion as for predicting breast-feeding intention (Table 4, Part B). In this model, the normative beliefs construct made a small but significant contribution to the explanation of variance. The strongest correlate of Stages of Change for breast-feeding again was the Processes of Change construct, followed by women's amount of prior breast-feeding experience, $sr^2 = 0.05$, partial $F = 48.60$, $p < 0.01$. According to the regression models, the transtheoretical model was a stronger predictor of Stages of Change for breast-feeding than was the modified reasoned action model.

Table 4. Multiple Regression Results Predicting Breast-Feeding Intention and Stages of Change for Breast-Feeding From Demographic and Theoretical Variables and the Unique Contribution of Theoretical Variables to the Final Regression Model

A. Regression Models (breast-feeding intention)	Change in R^2 [a]	*F* Test	*p*
1. Demographics only	(.21)	$F(5, 718) = 37.48$	< 0.01
2. Demographics + MRAM	+.11	$F(7, 544) = 36.13$	< 0.01
3. Demographics + TM	+.16	$F(7, 561) = 46.22$	< 0.01
4. Demographics + MRAM + TM	+.16	$F(8, 525) = 38.09$	< 0.01
Full Model (demographics + MRAM + TM)	**sr^2**	**Partial *F* Test**	***p***
Outcome beliefs variable	.03	23.8452	< 0.01
Normative beliefs variable	.00	1.3106	n.s
Processes of Change variable	.05	41.2577	< 0.01
B. Regression Models (Stages of Change)	**Change in R^2 [a]**	***F* Test**	***p***
1. Demographics only	(.27)	$F(6, 705) = 44.23$	< 0.01
2. Demographics + MRAM	+.15	$F(8, 535) = 49.13$	< 0.01
3. Demographics + TM	+.20	$F(8, 550) = 61.86$	< 0.01
4. Demographics + MRAM + TM	+.22	$F(9, 516) = 55.57$	< 0.01
Full Model (demographics + MRAM + TM)	**sr^2**	**Partial *F* Test**	***p***
Outcome beliefs variable	.03	25.7718	< 0.01
Normative beliefs variable	.01	8.7916	< 0.01
Processes of Change variable	.07	67.9394	< 0.01

NOTE: Demographics = education, African American ethnicity, enrollment in food stamps, amount of breast-feeding experience, enrollment in the WIC program (parity also was used in predicting Stages of Change); MRAM = modified reasoned action model (normative beliefs and outcome beliefs variables); TM = transtheoretical model (Processes of Change and Decisional Balance variables); n.s. = not significant.

a. Change in R^2 over baseline model R^2 (in parentheses).

DISCUSSION

This study demonstrated the application of the transtheoretical model as well as a model (the modified reasoned action model) developed from the theory of reasoned action to understanding and predicting breast-feeding intention. Study results were highly consistent with findings in the literature regarding breast-feeding[10,11,15,16] and the two theoretical frameworks.[6,10,11,13,17,18] The results provide preliminary evidence for the applicability of the transtheoretical model with breast-feeding intention and provide indirect support for the utility of the theory of reasoned action concepts with breast-feeding issues.

After controlling for the potential influence of several sociodemographic and lifestyle factors on breast-feeding intention, this study identified the Processes of Change and outcome beliefs/Decisional Balance variables as being independently associated with breast-feeding intention. The normative beliefs, Processes of Change, and attitudinal

constructs also were independently associated with the Stages of Change for breast-feeding. The theoretical constructs were the strongest correlates of breast-feeding intention and were among the strongest correlates of Stages of Change for breast-feeding.

Transtheoretical Model

Study findings validated that the transtheoretical model constructs could predict and explain the intention to breast-feed in manners consistent with the model's framework. Women in latter Stages of Change, progressively intending to breast-feed for longer durations, had more positive and fewer negative breast-feeding attitudes than did women in earlier stages. However, even women who were planning to formula-feed or were uncertain about their infant feeding plans had many positive breast-feeding beliefs, as demonstrated by their mean attitudinal scores. The actual range of respondents' attitudinal scores also showed that no respondents had consistently strong negative views of breast-feeding across all of the examined attitudes. Therefore, women's personal attitudes are influential, but personal attitudes alone do not determine women's infant feeding plans.

Another construct significantly correlated with the infant feeding decision was Processes of Change. Women planning to breast-feed and planning to do so for longer durations reported using a progressively greater number of strategies to modify their behaviors and environments to support breast-feeding than did women uncertain of their infant feeding plans or planning to exclusively formula-feed. Furthermore, women in precontemplation used significantly fewer Processes of Change than did women in latter stages. These patterns are consistent with the transtheoretical model framework and previous research findings with various health behaviors.[6,7,17,18]

One inconsistency encountered while testing the model was in the action stage results. Action scores did not conform to the prescribed theoretical pattern of stage scores for the Decisional Balance con scale or the Processes of Change. Having fewer respondents in the action stage might have contributed to the discrepancies due to a truncated range of possible responses. Another potential explanation for the aberrant action stage results is that we did not define action consistently within the model constructs. We defined action as planning to breast-feed for "at least 1 month but probably not a full 6 months." Defining the action stage by when the decision to breast-feed had been made would be more congruent with the theory. However, this measurement would be difficult to accomplish due to the time constraints imposed by the events surrounding pregnancy and childbirth.

While controlling for the influence of demographic predictors of breast-feeding, the Processes of Change variable accounted for the most unique variance in both breast-feeding intention and Stages of Change for breast-feeding. The transtheoretical model constructs predicted breast-feeding intention and Stages of Change for breast-feeding more strongly than did either the demographic variables or the modified reasoned action model constructs, suggesting that the transtheoretical model might be a more effective tool for use in understanding and, ultimately, influencing women's infant feeding plans.

Moreover, this study provides further evidence of the transtheoretical model's flexibility in describing both positive and negative health issues. In addition, findings support use of the model to explain a health issue based solely on behavioral intention rather than on both intention and actual behavior, which traditionally comprise the Stages of Change construct. Despite the study's reliance on intention as opposed to behavior, research literature documents that breast-feeding intention is predictive of actual breast-feeding.[10,11,16] Therefore, increasing women's intention to breast-feed theoretically will result in increased breast-feeding rates.

In conjunction with further research on the application of the transtheoretical model to understanding breast-feeding intention, educators ideally will be able to develop interventions that match distinct breast-feeding promotional strategies to women's specific Stages of Change.[18] Tailoring breast-feeding interventions and education to the unique characteristics of the Stages of Change might provide, through the Processes of Change and Decisional Balance constructs, more effective methods for moving women closer toward the intention to breast-feed. Research demonstrates that this targeting of sequential stage-specific interventions is useful in promoting other health behaviors such as smoking cessation,[19] reduction of dietary fat intake,[20] and exercise adoption.[17]

Modified Reasoned Action Model

Results indicated that the modified reasoned action model constructs (founded on the theory of reasoned action) successfully explained and predicted breast-feeding intention, contributing further, albeit indirect, support for the utility of the theory of reasoned action with breast-feeding. Women planning to breast-feed had greater perceived social support for breast-feeding and averaged more positive beliefs about breast-feeding outcomes than did women planning to exclusively formula-feed. These findings are consistent with the theory of reasoned action[9] framework and corroborate previous breast-feeding research findings using the theory.[10-13] Outcome beliefs were more significantly related to the infant feeding decision than were the normative beliefs in this sample, implying that women's attitudes about perceived infant feeding outcomes might be more important than the advice of significant others when deciding on infant feeding methods. Moreover, the normative beliefs variable did not significantly contribute to the prediction of breast-feeding intention when accounting for the Processes of Change and demographic variables, further suggesting the greater compatibility of the transtheoretical model constructs, as opposed to the modified reasoned action model constructs, with breast-feeding intention.

Implications for Practice

Breast-Feeding

Our results suggest a new direction for breast-feeding promotion to low-income pregnant women using the constructs of the two behavioral science theories. The most promising finding was the considerable importance of the Processes of Change in determining breast-feeding intentions. These processes can serve as guidelines[18] for health educators about how to influence women's breast-feeding-related perceptions, attitudes, behaviors, environment, and skills based on their current infant feeding plans (i.e., their Stages of Change for breast-feeding). Such strategies founded on the processes could potentially be employed to more effectively promote breast-feeding to pregnant women by encouraging their movement between the Stages of Change, thereby fostering greater breast-feeding readiness.[7,18]

Women's breast-feeding attitudes also are meaningful in their infant feeding decisions and can be used to differentiate between women planning to breast-feed and those planning to formula-feed.[14] Although both examined models include assessment of outcome/attitudinal constructs,[9,18] the transtheoretical model emphasizes the importance of influencing both the positive and negative attitudes toward the behavior held by the

target population.[18] Given that the transtheoretical model successfully predicted breast-feeding intention in this study, educators should continue to promote the benefits of breast-feeding (pros) and to refute negative breast-feeding beliefs (cons) and misperceptions. Conversely, educators should discuss the hazards and disadvantages of formula-feeding during infant feeding education and should minimize the perceived benefits of formula. Traditional breast-feeding education often focuses exclusively on extolling the benefits of breast-feeding and fails to use the costs and risks of formula-feeding as an educational argument.

Breast-feeding intention was positively associated with greater perceived social support for breast-feeding, so health educators should consider inclusion of a woman's significant others, particularly her mother and the baby's father, in breast-feeding educational activities to help strengthen her social support for breast-feeding. Several other studies have documented the importance of significant others in women's infant feeding decisions.[10,11,13] Both breast-feeding education directed solely toward modifying the breast-feeding attitudes of influential significant others and breast-feeding in-services for health professionals, especially doctors and other clinic staff, can improve breast-feeding environmental and social support as well.

Public Health

Health professionals sometimes erroneously approach health education from the standpoint that clients already are in the preparation or action stage and, therefore, automatically provide more action-oriented education.[18] However, as this and other studies have demonstrated, many people actually are in alternative Stages of Change. Therefore, according to the model, these persons would require different educational strategies to more efficiently encourage, or maintain, a behavior change.[18] Furthermore, our findings confirmed that women's breast-feeding attitudes, perceived social support, and behavior change strategies did indeed differ according to their infant feeding plans (i.e., their stages). Rather than merely providing identical breast-feeding education to all women, these results suggest that women might benefit from a more theoretically based, tailored intervention approach reflective of their Stages of Change and dependent on their unique stage-related attitudes, beliefs, skills, and social situations.

Use of these and likely other theoretical frameworks can facilitate future development of more effective breast-feeding promotion strategies. Health educators could potentially achieve greater breast-feeding intention among their target populations by focusing their educational efforts on promoting the stepwise movement of women along the Stages of Change continuum. To accomplish this goal, educators should consider devising distinct breast-feeding intervention strategies tailored to each of the five Stages of Change. In addition, identification of modifiable social influences on breast-feeding intention according to the modified reasoned action model or the theory of reasoned action can further enhance breast-feeding intervention methods at each stage.

Limitations and Recommendations

These study findings should be interpreted with caution due to several methodological limitations. The sampling strategy was nonrandom, cross-sectional convenience sampling, which limits the interpretation and generalizability of the results. Due to time and

budgetary constraints, actual breast-feeding behavior was not measured; thus, the study could not predict actual breast-feeding in relation to women's prenatal infant feeding attitudes and intentions. However, several other studies have established a significant positive association between prenatal breast-feeding intention and postpartum breast-feeding initiation and duration.[10,11,13,16] Furthermore, not all of our participants were in the same trimester of pregnancy at the time of questionnaire completion, and this could have influenced their infant feeding plans,[16] although Manstead, Proffitt, and Smart[11] did not find this to be the case. Finally, we measured breast-feeding intention on a dichotomous scale as opposed to the customary Likert scale, and this might have influenced our findings.[9]

A direct comparison of the transtheoretical model and the theory of reasoned action was not possible secondary to the measurements used in this study. Because the study's focus was to compare the usefulness of the two theoretical models with respect to this health issue, it is imperative that the constructs for each model were measured as consistent with the model as possible. Although the measurement of our constructs generally conform to the theory of reasoned action and is consistent with that used in several other studies,[10-13] the constructs differ substantially enough from the ideal to make a direct reference to the theory inappropriate. Taking a more orthodox approach to operationalization of the variables in future research could be helpful.

No interviews or focus groups were used to determine which outcome beliefs or significant others were the most salient for our population. One of the authors (Amy S. Kloeblen) assembled the outcome beliefs and referents based on her extensive experience in conducting breast-feeding education and promotion directly with the population and on scales used with similar populations in the research literature. However, future studies likely would benefit from the use of conventional methods that could more accurately determine the population's most common outcome beliefs and referents.

Further, more rigorous research in the form of longitudinal and intervention studies is necessary to confirm these study findings and to continue the analysis of breast-feeding in the context of the two theories. Alternative populations and more representative and homogeneous samples of women are essential for future research. Analyzing the models separately also is vital to more precisely define means for evaluating constructs of each model. Moreover, assessing women's actual infant feeding behaviors during the postpartum period and comparing them to their prenatal attitudes and intentions will provide more comprehensive information than that which was collected in our study. The addition of self-efficacy measurements to the theoretical analyses also could be beneficial.[10,13,18]

Public health theoretical frameworks delineate behavioral, attitudinal, and social predictors that tend to be more malleable in nature than are demographic indicators and, therefore, are of more practical value for promoting behavior change. This study examined two behavior change models and demonstrated their utility in predicting breast-feeding intention among low-income pregnant women. Our preliminary evidence suggests that the transtheoretical model and modified reasoned action model could potentially serve as the foundation to more effective, tailored, breast-feeding educational strategies to promote the intention to breast-feed among pregnant women. The remaining research challenge is to further elucidate the complex decision-making and behavior change processes leading to the intention to breast-feed to generate more efficacious breast-feeding interventions. Use of behavioral science theories appears to be an effective method of meeting this objective.

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