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Examination of Maternal Assets and Breast Milk Expression

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Abstract

The proportion of mothers in the workforce has increased over the past 40 years. Examination of factors associated with a working/student mother's milk expression is needed to provide effective lactation support. The purpose of this study was to examine the role of maternal assets in the relationships between the theory constructs, intention, and behavior of breast milk expression. Using a cross-sectional design framed under the theory of planned behavior, all female personnel associated with a higher education institute in northern New Jersey were invited to participate in the online survey, Milk Expression on Campus. Attitude toward breast milk expression, subjective norm, perceived behavioral control, intention, and behavior of breast milk expression on campus as well as maternal assets such as income, education, living status, and campus role were measured. Maternal assets had no moderation role but showed a significant and meaningful mediation effect on the relationship between perceived behavioral control and the intention to express breast milk on campus, with effect size R^2=3.59%, 95% CI [-.1061, -.0047]. There was no mediation effect of the asset on the relationship between intention and the behavior of breast milk expression, 95% CI [-.0984, .0232]. Future breastfeeding support and promotion may direct its attention to provide systematic social and clinical support to enhance working/student maternal assets, e.g. family education, access to lactation services, or peer-based support programs, thereby helping mothers achieve their breastfeeding goals.

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Introduction

Health and emotional benefits of breastfeeding to both infants and mothers are widely known. Benefits include immunological protection for infants, mother-infant bonding, maternal postpartum weight loss, and favorable metabolic changes for mothers leading to a risk reduction of chronic diseases such as cardiovascular disease and certain cancers.[1,2] To optimize these benefits, the American Academy of Pediatrics recommends exclusive breastfeeding for the first 6 months and continued breastfeeding with complementary feeding for one year or longer as mutually desired by mother and infant.[3]

Yet not all women are meeting these exclusivity and duration goals. Studies show that breastfeeding exclusivity, intensity, or duration are associated with certain demographic factors such as age, marital status, income, education level, and work status.[4-11] Mothers' return to work is negatively associated with rate and duration of exclusive and overall breastfeeding.[9-11] Specifically, mothers who are older, married, have higher incomes, and higher education are more likely to breastfeed for a longer duration and maintain exclusivity compared to those who are younger, single, and have lower income and education.[4-8]

Among findings of many studies that discussed barriers to breastfeed, insufficient milk supply was listed as the primary reason for early breastfeeding termination.[12-16] Given the supply-demand cycle, if we could facilitate continued breastfeeding via feeding directly at breast and expressed mother's milk bottle feeding, mothers could maintain their milk supply, which in turn satisfy the infant's demand. In the case of working/student mothers who must express their milk, supports that ease milk expression, storage, and transport are critical. A recent study reported that women with both adequate break time and private space had 2.3 times (95% CI 1.03, 4.95) the odds of breastfeeding exclusively at 6 months compared to women without access to these accommodations.[17] Yet, working/student mothers mentioned lack of workplace/ school supports as main barriers[13] to express breast milk.

In 2016, 56.8% of all women in the United States participated in the labor force. Of those, 42% of women held a bachelor's degree and higher, compared with 11% in 1970.[18] Nearly 5 million, comprising 26% of the total college population are parent students with dependent children.[19] With this increasing number of women in the labor force and parent students, it is important to provide effective support to nursing mothers in the workplace and schools.

The theory of planned behavior (TPB) is often utilized to understand breastfeeding behaviors.[20-24] This theory posits that behavior is directly linked to the intention to perform the behavior. The intention, in turn, is influenced by three direct constructs: attitude, subjective norm, and perceived behavioral control. For breastfeeding behaviors, these three constructs appear to be associated with the intention or behavior in varying degrees depending on the population studied.[20,25] In one particular study that examined expressing mother's milk on campus[12], having low perceived behavioral control was the primary barrier for intention to express milk.

Authors extended the TPB to include certain maternal assets as possible predictors or mediators. The theory regards demographic factors such as income, race, working status, and living status as external factors that influence the intention or behavior under the surface and operate only through the theoretical constructs-attitude, subjective norm, and perceived behavioral control—by shaping beliefs underlying these direct constructs.[26]

However, there is a rich literature that directly links demographic factors such as age, income, education, and type of occupation with breastfeeding outcomes.[4-8, 27] In fact, some research suggested that socioeconomic status may be the actual cause of the breastfeeding benefits. For example, Anderson et al[28] reported that the child's increased cognitive function was the combined effect of high-quality food afforded by high socioeconomic status, stimulation in the home environment and sleep pattern as well as breastfeeding. Other researchers reported that child's positive cognitive outcomes were attributed to maternal IQ and the quality of the home environment instead of breastfeeding duration or exclusivity.[29-30] These findings imply that socioeconomic status may be causal factors for breastfeeding benefits. In addition, reports regarding the

relationship between exclusivity and child health have been inconsistent as benefits of breastfeeding were more immediate in terms of nutrition and immunity than definitive long-term, especially for cognitive outcomes.[31] In light of this direct influence of socioeconomic status and demographic factors on breastfeeding benefits, it is important to identify the point that we can intervene effectively to support and promote breastfeeding.

To this end, this study distinguished certain factors as maternal assets (income, education level, living status, and campus role) and then positioned them in the context of the TPB in order to examine their roles in breast milk expression behavior and intention. Understanding the effects of maternal assets on intention and behavior will allow us to gain a deeper insight for future policy recommendation to support breastfeeding.

Methods

This study used a cross-sectional survey design to examine the role of maternal assets in relation to the intention to express human milk on a university campus and the behavior of milk expression. The Institutional Review Board at Montclair State University approved the study protocol. The survey was conducted online during spring of 2015 at a public university in northern New Jersey. At the time of the study, 78% students enrolled full time and 22% part time, and 64% of all student population on campus was female. Among employees, 53% worked full-time and 47% worked part time, and 55% of all employees were female.

Between January and February 2015, participants were recruited via campus-based email solicitations. All current female students and employees in the university database received an invitation to participate. To be eligible to participate, women needed to be breastfeeding or expressing breast milk at the time of the study or any time in the previous 3 years. Voluntary participants proceeded with the study by clicking the survey link provided in the invitation email, which led to the consent form. Affirmatively consented participants completed the survey and were entered into a $25 gift card raffle drawing. The survey was available for approximately 2 months. Once the survey closed, all responses were downloaded, and only completed surveys were used for analysis.

Measurement

Constructs of the TPB, milk expression behavior, and maternal assets were measured using an online survey, Milk Expression on Campus, developed based on the findings from a qualitative study.[13] Measured constructs were intention to express milk on campus, attitude toward expressing milk, subjective norm, and perceived behavioral control of milk expression on campus. Maternal asset measures were included in demography questions. The instrument was valid with strong internal consistency (α = .78), and theoretical construct subscales accounted for 79.5% of the total variability.[24]

Theoretical constructs were measured using 7-point scales asking the degree of agreement with each statement presented (7=strongly agree, 1=strongly disagree). Intention was measured by asking: I expect to pump breast milk on campus each time I am on campus; I intend to pump breast milk on campus each time I am on campus. Attitudes were measured using 5 semantic scales in response to statements: I think that pumping breast milk on campus is: bad or good; unpleasant or pleasant; harmful or beneficial; inconvenient or convenient; worthless or valuable. Subjective norm was measured by asking: Mothers like me pump/express breast milk on campus; it is expected of me that I pump/express breast milk on campus. Perceived behavioral control was examined by asking women the level of confidence and surety: I am confident that I can pump breast milk on campus; Whether I pump breast milk on campus is entirely up to me. Demography questions were asked at the end of the survey, including age, race, education, income, living status (living alone, living with a partner/spouse), and campus role (faculty, staff, and students). Lastly, the behavior was measured by asking if they pumped/ expressed breast milk on campus.

Data Analysis

Descriptive analysis summarized the participant demography. To understand the role of maternal assets in the context of TPB, authors employed PROCESS analyses in which a series of multiple regression analyses was performed to delineate the pathways among predictor, mediator, and outcome. Moderation is said to occur when there exists a significant interaction

between predictor, moderator and outcome. Mediation refers to a situation when the relationship between a predictor and outcome is explained by their relationship to a third variable, the mediator.[32] In analyses, maternal asset is entered either as a mediator or moderator. When examining the relationship between perceived behavioral control and intention, perceived behavioral control is the predictor, whereas intention is the outcome (Figure 1). Similarly, when examining the relationship between intention and behavior, intention is the predictor and behavior is the outcome (Figure 2).

In the case that including the mediator reduces the strength of the simple relationship between the predictor and outcome, a mediation effect exists. Perfect mediation occurs when the mediator in the model washes out the relationship between the predictor and outcome. In order to have the mediation role, 4 conditions must be met: (1) the predictor variable must significantly predict the outcome variable, (2) the predictor variable must significantly predict the mediator variable, (3) the mediator must significantly predict the outcome variable, and (4) the predictor variable must predict the outcome variable less strongly when the mediator is in the model together.[32,33]

PROCESS uses a series of regression analyses to examine relationships among predictor, mediator or moderator, and outcome. There was no significant interaction found, subsequently ruling out the

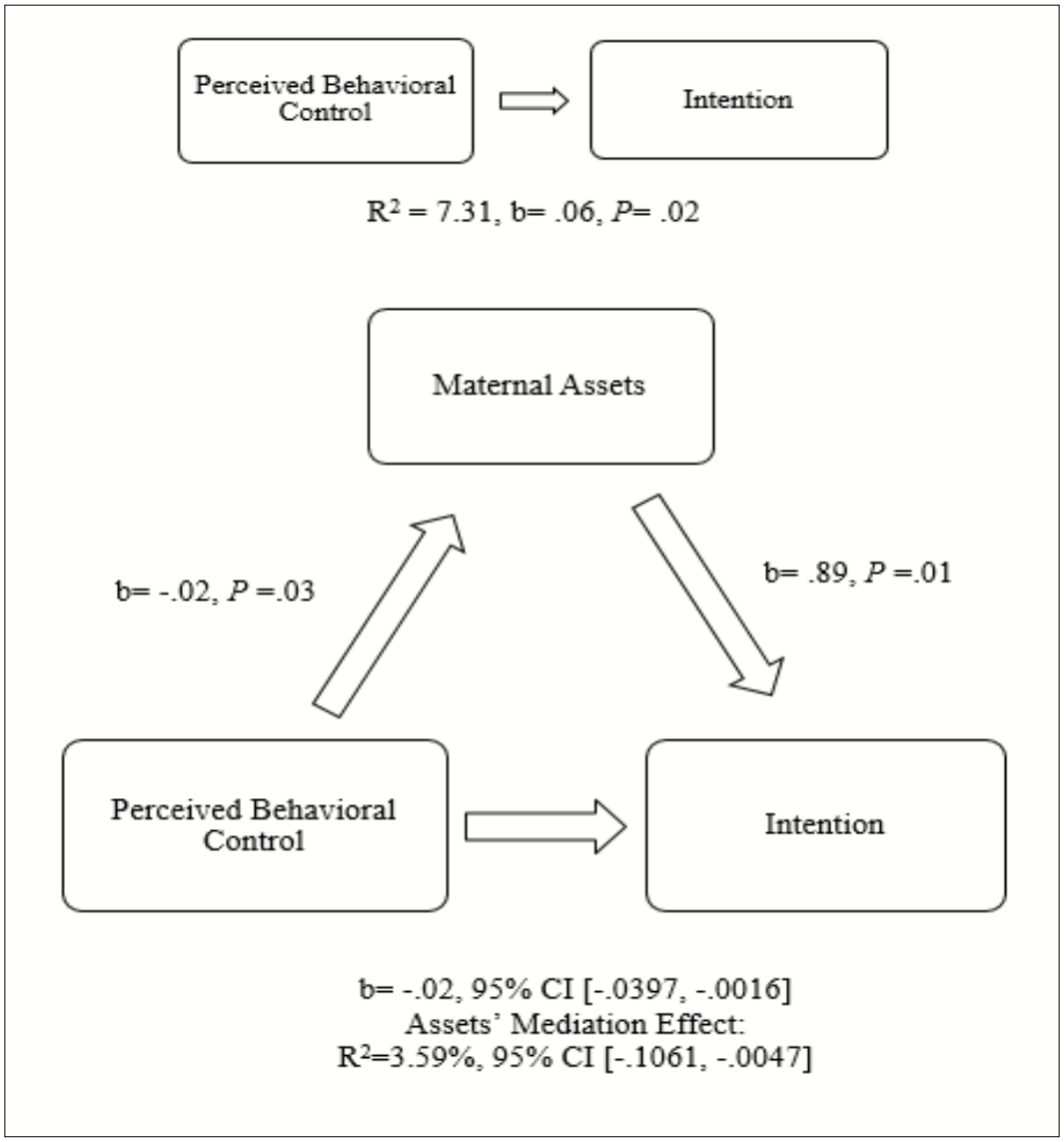

Figure 1. Relationships between perceived behavioral control, maternal assets, and intention

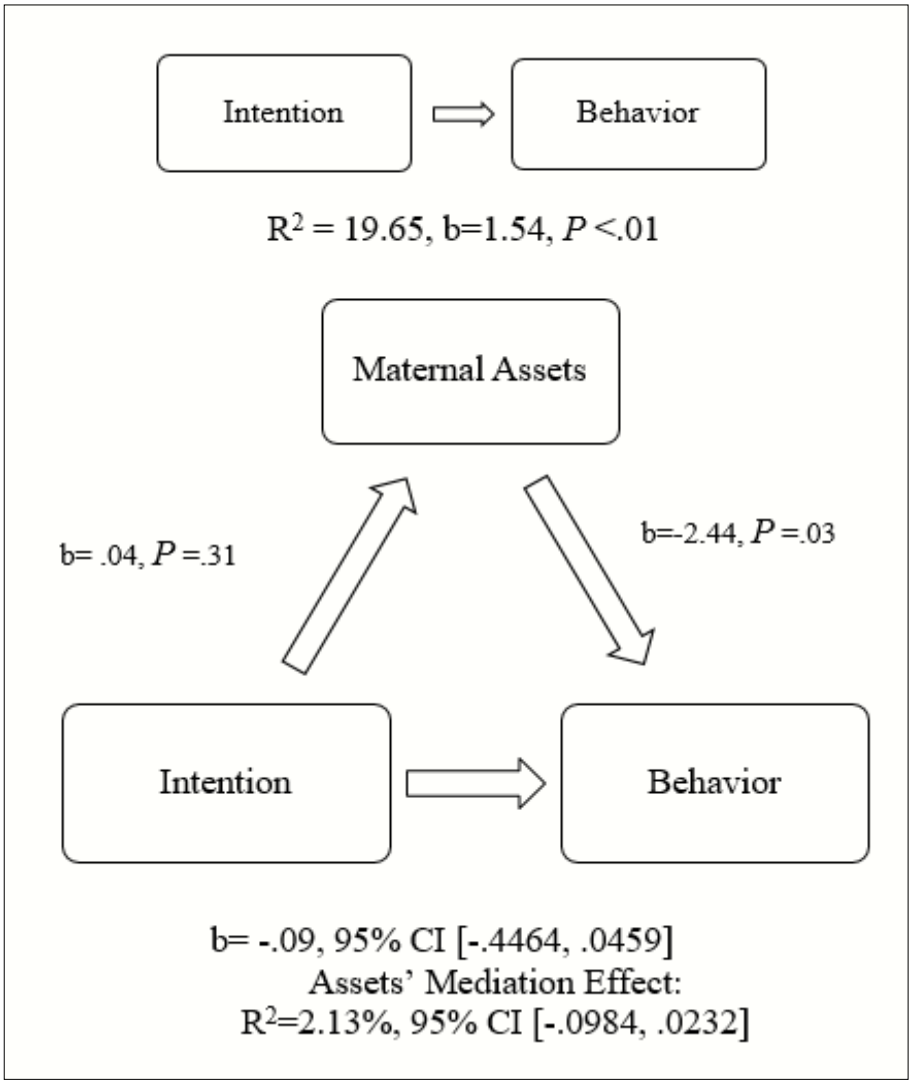

Figure 2. Relationships between intention, maternal assets, and behavior

moderation effect between factors. The PROCESS computes specific indirect effects of potential mediator as the product of the ordinary least-squares coefficient for the relation between the predictor and the mediator and the regression coefficient for the relation between the mediator and the outcome variable.[34] Coefficients in each model represented the strength of relationship between variables. Simple relationships between predictor and outcome, predictor and mediator, and then mediator and outcome were examined. Finally, the indirect effect of predictor on the outcome was tested, in which the mediation role of the asset variable would be manifested. If the indirect effect was significant, it meant that the predictor affected the outcome variable via the mediator. To examine the significance of the effect of mediation, 95% confidence intervals (CI) were computed using bootstrap methods.[33,35] By examining the effect size measures of the mediation effect, we could judge whether meaningful mediation occurred. All statistical analyses were performed using SPSS version 23. Significance level was set at 0.05 and 2-tailed tests were performed in places where *P* values were reported.

Maternal Assets

The asset variable was created based on women's education level, income, living status, and campus role. Each of these variables was scored according to the direction of association with breastfeeding behaviors per prior research, and the summative score across all variables was denoted as the asset variable. For example, the 2014 National Immunization Survey reported that breastfeeding initiation and exclusivity rates were greater for women

with higher income and education levels compared to those with lower resources.[36] Similarly, breastfeeding rates are higher among married compared to single women, and among those ready access to a private space for milk expression.[17, 37] As such, the highest asset value within each category was assigned the largest number on the scale: education scores ranged from 1 (high school) to 4 (doctorate), income from 1 (lowest income) to (4 highest income), living status from 1 (alone) to 2 (living with a partner), and campus role 1 (student) to 3 (faculty). When added together, the composite asset variable score ranged from 4 to 13.

Results

A total of 218 women completed the survey. Of these, only 78 (36%) women answered all demography variables that were needed to create the composite asset score. Therefore, a total of 78 responses were included in the mediation analyses and reported here. The final sample was predominantly white (65%), students (63%), living with spouse/partner (82%), finished bachelor's degree and above (83%), 61% of participants had income between $76,001-96,000, and mean age 32.43 (6.48).

As shown in Figure 1, there was a significant simple relationship between perceived behavioral control and intention (b=.06, p=.02). Perceived behavioral control significantly predicted the maternal asset (b=-.02, p=.03), and the maternal asset significantly predicted the intention (b=.89, p=.01). When the maternal asset was included in the model, the strength of the relationship between perceived behavioral control and intention was reduced (b=-.02, 95% CI [-.0397, -.0016]), confirming the mediation effect of the maternal asset. The effect size of this mediation was significant at R^2=3.59%, 95% CI [-.1061, -.0047]. The significant effect size, though small, indicated that the mediation role of the asset variable was genuine and meaningful.

Following the same analysis protocol using PROCESS, the mediation effect of maternal assets was tested in relation between intention and the behavior of breast milk expression (Figure 2). The simple relationship was significant between the intention and behavior of milk expression (b=1.54, p< .01). The maternal asset predicted the behavior (b= -2.44, p= .03). However, intention did not significantly predict the maternal assets (b=.04, p=.31), failing to show the mediation role. The insignificant effect size further proved no mediation effect of the maternal assets, R^2= 2.13%, 95% CI [-.0984, .0232]. There seemed to be no mediation role of maternal assets present for the relationship between intention and behavior in this sample.

Discussion

When examining a behavior under the TPB frame, theory constructs are main predictors of the behavior. This is because the theory explains that any demographic and social factors would operate under the surface and influence the intention or behavior only through theory constructs.[25] A meta-analysis report from ten studies stated that attitude, subjective norms, and perceived behavioral control were all significant predictors of breastfeeding intention and behavior.[26] Another systematic analysis performed on studies that used the TPB reported various findings in assessing the relationship between maternal attitudes, subjective norms, perceived behavioral control and breastfeeding duration.[38] These varying findings were due to the fact that influencing factors were specific to the target population and the behavior.

In an effort to understand the influence of factors other than theory constructs on breastfeeding behavior, researchers have tested other factors as additional variables. To explain exclusive breastfeeding intention and behavior, Ismail et al[39] included breastfeeding difficulty and postpartum support as additional predictors. They found the direct relationship of breastfeeding behavior with postpartum support and breastfeeding difficulty. However, the relationship of these additional factors and the theory constructs were not examined in the context of the theory to allow deeper understanding of the behavior. Instead, the additional factors were regarded as external variables to account for the variability of the behavior. Another recent study that examined father's intention to encourage breastfeeding reported that attitude was highly correlated with the intention, without offering insight into the complex path of the relationship between attitude and the intention by considering potential factors in the model.[36]

Understanding significant theory constructs of the behavior is important, but in designing intervention and promotion, a program planner needs to know which specific aspects s/he needs to focus. If the path from theory constructs to intention and behavior with all additional variables included within the theory context is understood, it could alleviate the challenge of not knowing where to focus the effort and facilitate the effective program design and policy development.

The current study delineated the pathway from perceived behavioral control to intention to express milk via the mediator—maternal assets. In other words, the mediator was situated in the context of the theory to illuminate the profound relationship between theory construct, mediator, and the intention. Specifically, our study revealed that women could be empowered by their assets to formulate the intention to express milk, despite potential barriers'[13] presence such as lack of space, time, or workplace support. The surety and confidence to express milk on campus measured by the perceived behavioral control in this study had a small contribution to the intention relative to the asset variable. For this milk expression behavior, the asset variable had a prominent role to formulate the intention.

That is, having spousal support, higher education and income, and being a faculty member on campus would override the existence of woman's perceived control over the behavior. Even when the woman was not sure to express milk on campus, having many assets would have facilitated the intention to do so. By enhancing their asset score, women may more easily develop an intention to express breast milk on campus, hence leading to the behavior. On the other hand, women's assets did not have a distinctive role as a mediator for the expression behavior. This may mean that once the intention is formed, maternal assets would not have an additional role to influence the behavior. This reinforced the significance of the mediating maternal assets to formulate the intention.

The moderation effect was ruled out due to insignificant interactions among factors. However, the mediation effect found in this study was small, yet genuine. Future studies could generate a comprehensive asset score by fully capturing women's social, emotional, and financial resources. Resources worth consideration for the comprehensive asset score include prior experience with chest-feeding or milk expression, peer support, perinatal preparation for milk expression, mental/physical time availability for milk expression, and access to a breast pump. The comprehensive asset variable may mediate the intention formulation with a strong effect; thereby validating the current findings.

Women are constantly balancing their intention to breastfeed and their reality. In the process, they encounter inconsistent views from people around them.[41,42] Working and student mothers face this challenge daily and need a support system that facilitates breast milk expression to achieve their breastfeeding goals.[13] Having infrastructure in place that improves a woman's asset score can increase the support effort further. Although some of the variables included in the asset score may seem non-modifiable, alternatives can be found to enhance the variables. For example, for women who are single or living alone, educating family members and/or friends on how to provide support can fill a gap in the asset score as it relates to living status. Social policies that affect educational attainment can be developed to further women's general education level. Particularly on college campuses, student assets could be increased if student mothers are provided with peer-based programs to support breastfeeding and milk expression. Hospital grade breast pump loan and lactation consultation support at free of charge can also enhance the asset score for all. Especially, the pump loan service on campus can facilitate breast milk expression on campus for parent students as students reported[13] that carrying pumping equipment all across the campus was a challenge and a hindrance to express milk.

Recall bias is one limitation as this used a cross sectional survey design. Data from women who were recounting relatively current experience, thoughts, and perceptions may vary compared to the data from women who were recounting retrospectively as authors had a relatively wide range of mothers with milk expression experiences. Other limitations include a small sample size, thus limiting generalizability, due to missing data points on several demography variables needed for the asset variable. Authors may improve this in the future by placing those questions in the beginning of the survey. The study sample was drawn from one university as a pilot, thus somewhat homogeneous

regarding races, income and education level. Differences in the availability and types of spaces to express milk in university campuses could not be accounted for in this study, due to location limitation. Future studies may appeal more diverse respondents by expanding the setting in other locations and types of institutions. In addition, women with a positive past experience may have a greater intention to breastfeed or express the second time, regardless of the assets. Conversely, a past negative experience, regardless of high asset, may lead to a negative intention. Future studies may examine the role of positive or negative breastfeeding experiences that may matter more than women's actual assets.

Conclusion

Maternal assets could play an important role to formulate woman's intention to express breast milk. Social systems that can support women's and family education, implement peer-based programs, and access to lactation supplies and services could be instrumental to enhance maternal assets, thereby supporting multifaceted breastfeeding promotion efforts in the era of increasing women, especially mothers, in the work force and higher education.

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Conflict of Interest

There is no conflict of interest to acknowledge.

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