PREDICTORS OF BEHAVIORAL INTENTION AND VITAMIN SUPPLEMENT USE IN A COLLEGE SAMPLE OF MEXICAN- AMERICAN WOMEN

THESIS

Presented to the Graduate Council of
Texas State University-San Marcos
in Partial Fulfillment
of the Requirements

for the Degree

Master of ARTS

by

Kevin M. Gutierrez, B.S.

San Marcos, Texas
May 2009

ACKNOWLEDGEMENTS

I would like to thank my committee, Dr. Mendez, Dr. Ginsburg, and Dr. Raffeld for their guidance, patience, good cheer, and devotion in helping my thesis come together. Special thanks to Dr. Mendez for his encouragement and belief in me, to Dr. Ginsburg who enabled me to realize my dream by helping me find my place in the Health Psychology program, and to Dr. Raffeld who nurtured a respect and passion for methodology I hadn't adequately articulated. Dr. Mendez, Dr. Ginsburg, and Dr. Raffeld are the kind of professors I myself aspire to become.

This manuscript was submitted on March 23, 2009.

TABLE OF CONTENTS

LIST OF TABLES

Table **Page**

ABSTRACT

PREDICTORS OF BEHAVIORAL INTENTION AND VITAMIN SUPPLEMENT USE IN A COLLEGE SAMPLE OF MEXICAN-AMERICAN WOMEN

by

Kevin M. Gutierrez, B.S.

Texas State University–San Marcos

May 2009

SUPERVISING PROFESSOR: ROQUE V. MENDEZ

Neural tube defects (NTDs) are malformations of the brain and spine which can result from inadequate folic acid intake (CDC, 2007). Every year approximately 3000 deaths in the United States are attributable to NTDs. All women who are capable of conceiving a child should consume 400 micrograms of folic acid in order to substantially decrease the likelihood of an NTD-affected pregnancy (CDC, n.d.). Hispanic women are a particularly vulnerable population. In the United States, NTD occurrence has been

highest among Hispanics when compared to African American and white women populations (CDC, n.d.).

A widely cited and useful model in explaining behavior is Ajzen's theory of planned behavior (TPB) that has recently been applied, with promising results, to vitamin supplementation (Conner, 2001). A review of the literature in *PsychInfo* and *Medline* reveals an absence of studies exploring predictor variables of vitamin intake in the Latino female population. Thus, one might expect Ajzen's TPB to also apply to the Latino population.

Based on Ajzen's TPB model, I predict: vitamin takers should; (1) have more positive attitudes towards taking vitamins; (2) perceive more pressure from others to take vitamins; (3) have greater Perceived Behavioral Control; and (4) have greater Intentions to take vitamins than non-vitamin takers. Furthermore, I predict: (5) Attitude, Subjective Norm, and Perceived Behavioral Control (PBC) predict intention to take vitamins; and (6) Perceived Behavioral Control and Intention predict vitamin intake.

Results of this study show that vitamin takers perceived more pressure from others to take vitamins, had greater PBC towards taking vitamins, and had greater intentions to take vitamins when compared to non-vitamin takers. However, the two groups did not differ on measures of Attitude towards vitamins. In addition, Attitude, Subjective Norm, and PBC predicted Intention to take vitamins with the Subjective Norm factor being the strongest predictor of Intention to take vitamins. Furthermore, Intention, but not PBC, predicted self-reported Vitamin Intake. By ascertaining the predictors of vitamin intake in Hispanics successful interventions can be tailored to increase their vitamin supplementation resulting in decreased incidence of NTDs.

CHAPTER I

INTRODUCTION AND REVIEW OF LITERATURE

Neural tube defects (NTDs) cause approximately 3000 deaths per year in the United States (CDC, 2007). NTDs are birth defects that result in malformations of the brain and spine. The two most prevalent NTDs are anencephaly and spina bifida. Anencephaly occurs when the brain or cranium forms improperly often resulting in brain and cranial bone loss. Babies born with anencephaly typically die in utero or shortly after birth. Babies born with spina bifida have spine and back bone malformations typically resulting in the exposure of the spinal cord. Frequently, individuals with spina bifida often require several surgeries over the course of their life span. Common problems include loss of ambulatory movement in the lower extremities, loss of bladder and bowel control, and hydrocephalus, a condition where excess fluid buildup exerts increasing pressure in the brain necessitating surgery. Other problems include allergies to latex and learning disabilities (CDC, 2005).

Fortunately, incidence of NTDs can be prevented with adequate folic acid intake. Czeizel and Dudas as cited in Hasenau (2006) found that NTDs are highly preventable with proper folic acid supplementation reducing the risk virtually in half. In 1992, the Public Health Service recommended that all women who are capable of conceiving a child consume 400 micrograms of folic acid in order to substantially decrease the

likelihood of an NTD-affected pregnancy (CDC, n.d.). In 1996, the Food and Drug Administration (FDA) required all grain and flour based products be fortified with folic acid (Hasenau, 2006), and full compliance by manufacturers became effective January 1st, 1998 (Honein, 2001).

Obtaining 400 micrograms of folate daily by eating the right foods can be more difficult than simply obtaining it from a multivitamin. Consuming at least 400 micrograms of folate through dietary means requires a careful consideration of foods rich in folate, and adequate meal planning is crucial if one is to maintain this level. Oftentimes, the demands of daily life coupled with a hectic schedule make it hard to eat the right foods let alone keep track of how much folate one consumes. Therefore, simply taking a multivitamin a day, that contains the recommended daily allowance of 400 micrograms of folic acid, should be easier to implement and maintain than obtaining the nutrient through dietary means.

In addition, there may be added benefits of taking folic acid supplements rather than obtaining the nutrient from food sources. Research suggests that *folic acid*, the synthetic counterpart of naturally occurring *folate* in food sources, is more readily absorbed by the body (Winkels, 2007). Folic acid, commonly found in multivitamins, is fully oxidized and stable as compared to folate found in food sources making this form of the nutrient more readily absorbed in the digestive tract. This "bioavailability" makes folic acid more available for metabolic processes relative to food-sourced folate. Results from a four week diet-controlled study found that the bioavailability of food folates is, on average, only 82% of that obtained from folic acid (Winkels, 2007).

Individuals known to consume the minimum amount of multivitamins are those that are the most at risk for vitamin deficiencies. Kirk et al. (as cited in Conner, 2001) referred to it as the "inverse supplement hypothesis." In particular, Pawlak (2007), citing the Center for Disease Control *Mortality and Morbidity Weekly Report* in 2005, noted that individuals with low socioeconomic status (SES), minorities, and women 25 years old and younger are at risk for NTDs which can, quite easily, be prevented by proper folic acid intake.

Hence, identifying the predictors leading to habitual vitamin intake may prove particularly beneficial by decreasing NTD occurrences in at-risk groups. The necessity for theory driven research is central to this goal as the decisions to maintain adequate folic acid levels ultimately lie with the individual.

Ajzen's Theory of Planned Behavior

Whether one is taking vitamins, improving dietary choices, or implementing an exercise regimen, intention is often a necessary precursor to successful behavioral change. An often cited and well documented model explaining various influences on behavioral intention is Ajzen's (1991) theory of planned behavior (TPB) which maintains that Attitudes, Subjective Norms (SN), and Perceived Behavioral Control (PBC) directly influence Intention and subsequent behavioral change.

The Attitude one holds towards a behavior is the subjective evaluation one places on that behavior, be it positive or negative (Ajzen, 2006). Attitudes toward behaviors are shaped by behavioral beliefs, which are personal beliefs about how a particular behavior will produce a particular outcome. For example, a positive attitude toward vitamins may be based on the belief that good personal health, having a healthy baby or staying fit, etc

comes from taking vitamins (or that taking vitamins leads to all these good things). Moreover, Ajzen (2006) argues that the strength of each belief is weighted by the evaluation of the outcome or attribute. For example, an outcome of feeling good and staying fit strengthens the belief that taking vitamins increases health and one's attitude towards vitamins.

Subjective Norm is defined as, "perceived social pressure to engage or not to engage in a behavior," (Ajzen, 2006) and consist of normative beliefs or beliefs about what others expect of us and our motivation to comply with them. For example, if the social network surrounding the individual values and espouses vitamin consumption and the individual is motivated to comply with their social network, then the individual is likely to embrace taking vitamins.

According to Ajzen's model, Perceived Behavioral Control (PBC) refers to one's perceptions of one's ability to perform a certain behavior. PBC "...is determined by the total set of accessible control beliefs, i.e., beliefs about the presence of factors that may facilitate or impede performance of a behavior" (Ajzen, 2006). For example, if one believes that there are many obstacles preventing one from initiating or maintaining vitamin intake (control belief) one will likely feel a marked inability and diminished sense of control towards taking vitamins. In such a predicament an individual is likely to refrain from taking vitamins.

It is important to note that other factors such as a belief in fate may influence individual perceptions of PBC. For example, *fatalismo* (i.e. fatalism), a belief commonly held by many in the Hispanic population, refers to belief that God and fate are ultimately responsible for life's outcomes. Illness, seen in this light, is the result of *castigo divino* or

"divine punishment." (Baquet & Hunter, 1995; Falicov, 1996 as cited in Antshel, 2002). The belief that God or fate is responsible for life's outcomes (e.g. health) would likely decrease the level of personal control (or PBC) one feels towards their ability to influence health outcomes.

In short, behavioral Intention is the aggregate product of the constructs of Attitude towards the behavior, Subjective Norms, and PBC over the behavior, and behavioral Intention predicts, to a certain degree, the likelihood that an individual will implement or maintain a particular behavior. Furthermore, Ajzen's model stipulates direct effects of PBC on behavior unmediated by Intention. PBC is the only construct in Ajzen's TPB model that has direct effects on behavior (see Figure 1).

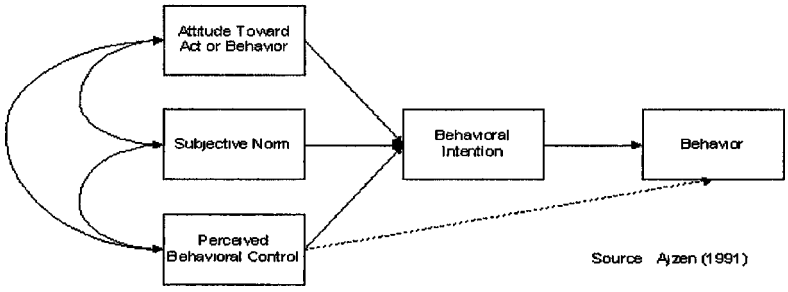

Figure 1. Ajzen's Theory of Planned Behavior (TPB)

TPB in Action

As applied to health related behavioral change, Ajzen's TPB has proven efficacious in explaining behavioral intention formation and subsequent behavioral implementation for a range of behaviors. For example, Godin and Kok (as cited in Pawlak et al., 2007) noted that TPB has been successful in explaining a spectrum of behaviors including oral hygiene, eating, exercising, condom use, addiction, and health screening behaviors.

Recently, TPB has been applied to vitamin supplementation. Conner et al. (2001), employing components of the TPB to explore why women use dietary supplements, found that there were significant differences between pre-existing intact groups of users and non-users in TPB constructs. For example, current supplement users had significantly higher positive Attitudes towards dietary supplements, perceived greater normative pressure (Subjective Norm) towards using supplements, reported higher rates of PBC, and exhibited more pronounced Intentions to use supplements than non-users. Moreover, the results showed that behavioral Intention to use supplements was a significant predictor of supplement consumption. Furthermore, likelihood of using supplements more than doubled for every unit increase in intention score. Attitude, PBC and Subjective Norm significantly predicted Intention to use vitamins accounting for 70.4% of Intention variance. Attitude had the greatest influence on Intention, followed by Subjective Norm and PBC.

A more recent study by Conner et al. (2003) explored TPB constructs in a cohort of women living in the United Kingdom. Stronger Intentions to consume dietary supplements were correlated with holding more positive Attitudes towards use, a perception of Subjective Norm supporting use, and a perception of control (PBC) over supplement use. Attitude, Subjective Norm, and PBC all significantly predicted behavioral Intention to use supplements with Attitude exhibiting the greatest influence on Intention. In addition, Intention to use supplements was the strongest predictor of supplement use with likelihood of using supplements more than doubling for every one unit increase in intention score. Moreover, the intact supplement-using group had greater Intentions to use, reported more positive Attitudes, had higher subjective perception

pressures from social group to use supplements, and had a greater sense of PBC than the intact non-supplement-using group.

Pawlak et al. (2005), when applying TPB components in predicting multivitamin use in African-American college students, found that 65% of the variance in behavioral Intention to take vitamins was accounted for by Attitude, Subjective Norm, and PBC, with Subjective Norm having the highest influence followed by PBC and Attitude respectively. Furthermore, behavioral Intention was a significant predictor of multivitamin use accounting for 59.2% of the variance.

In a more recent article, Pawlak et al. (2007) explored multivitamin use among Caucasian college females with Ajzen's TPB Model in mind. The combined contributions of Attitude, Subjective Norm, and PBC accounted for 49.7% of the total behavioral Intention variance with Attitude yielding the greatest influence followed by PBC. The effect of Subjective Norm did not reach statistical significance. Analysis of multivitamin users and non-users revealed statistically significant differences between the two groups with current users having greater behavioral Intentions to use vitamins than non-users. Furthermore, in non-users, the combined effects of Attitude, Subjective Norm, and PBC accounted for only 35.6% of behavioral Intention variance with only Attitude reaching statistical significance.

Taken together, the preceding studies showed that Attitude was the strongest predictor of behavioral Intention to take vitamins in Caucasian college females (Pawlak, 2007) and in women living in the United Kingdom (Conner, 2003) whereas Subjective Norm was the strongest predictor of Intention to take vitamins in African-American college students (Pawlak, 2005). Currently, a review of the literature in *PsychInfo* and

Medline reveals an absence of studies exploring predictor variables of vitamin intake in the Latino female population. By exploring predictors of Intention to take vitamins in Latino females culturally appropriate interventions can be developed.

At-Risk Groups and Rationale

Ajzen's TPB may prove useful in tailoring interventions designed at increasing vitamin/folic acid adherence in lower SES and young Hispanic women. These groups, in particular, are at a great risk of conceiving infants with such afflictions (CDC, n.d.) and the urgency is clear. According to the CDC (2007), with the exception of 2004, no substantial increases in the proportion of women using folic acid supplements was reported. Furthermore, a national report by the Center for Public Policy Priorities (2007) showed that Texas has the highest teen birth rate in the country and an 11% increase in infant mortality rates from 2000 to 2004. Moreover, with the exception of the 10-14 age category, Hispanic births rates in Texas were higher in every age group when compared to African American and White populations (DSHS, 2001).

A cluster of NTD cases in Cameron County, Texas in 1991 brought international attention to these risks in Hispanic women. The NTD incidence of 27 in 10,000 births was two and a half times the national rate of NTDs (Hendricks, Simpson, & Larsen as cited in Felkner et al., 2002). In response to this concern, the Texas Department of Health (TDH) started the Texas Neural Tube Defect Project in 14 border counties (Felkner et al., 2002). The investigations were comprehensive and extensive and assessed a variety of risk factors implicated in the etiology of NTDs such as diabetes, obesity, gene polymorphisms, dietary nitrates, corn molds, heavy metals, and even the ulcer-causing bacteria *Heliobacter pylori* (Texas Dept. of State Health Services, 2008). Of

particular concern is the finding that dietary intake of folic acid in Hispanic women living in the US-Mexico border was too low for conclusions to be drawn regarding the protective effects of folic acid (Suarez et al., as cited in Texas Dept. of State Health Services, 2008). This underscores the need to motivate Hispanic women to establish the healthy habit of a daily multivitamin to decrease the likelihood of an NTD-affected pregnancy.

Clearly, examining the predictors of vitamin intake in the Hispanic population and the relative contributions of TPB components within this group is of utmost importance and would provide pertinent information for successful intervention strategies. As aforementioned, a review of the literature in *PsychInfo* and *Medline* reveals an absence of studies exploring predictor variables of vitamin intake in at-risk Hispanic populations. By ascertaining the predictors of vitamin intake in the Hispanic population successful interventions can be tailored in order to increase vitamin supplementation resulting in decreased incidence of NTDs.

Hypotheses

Based on the literature review, I predict: vitamin takers should; (1) have more positive attitudes towards taking vitamins; (2) perceive more pressure from others to take vitamins; (3) have greater Perceived Behavioral Control; and (4) have greater Intentions to take vitamins than non-vitamin takers. Furthermore, I predict: (5) Attitude, Subjective Norm, and Perceived Behavioral Control (PBC) predict intention to take vitamins; and (6) Perceived Behavioral Control and Intention predict vitamin intake. By ascertaining the predictors of vitamin intake in the Hispanic population successful interventions can

be tailored to increase their vitamin supplementation resulting in decreased incidence of NTDs.

CHAPTER II

METHODOLOGY

Participants

The participants included 64 Texas State University-San Marcos Hispanic female students. Participants were recruited through lecture announcements, ads in the psychology building, and flyer solicitation in the vicinity of the psychology building. All participants received two $5.00 gifts cards from either the HEB or Wal Mart grocery stores upon completion of the survey.

Materials

The materials utilized for the purpose of this study include a weight scale with a height marker. The survey included questions germane to the constructs described in Ajzen's TPB model. The item "*Most people whose opinion matters to me think that I should take vitamins*" measured Subjective Norm and answers included a 5-point Likert scale with 1 being strongly disagree and 5 being strongly agree.

Attitude was created using a composite of 7 items each on a 6-point scale measuring attitudes towards vitamins. Examples include *good-bad, pleasant-unpleasant, harmful-beneficial* (see Appendix). PBC was comprised of 4 items: (a) *Taking vitamins everyday is something that is easy for me to do*; (b) *There are many obstacles that would*

prevent me from taking vitamins every day; (c*) I do not have much control over whether or not I can take vitamins every day*, and; (d*) I am confident that I will be able to take vitamins every day*. Answers, also, were on a 5-point Likert scale with 1 being strongly agree and 5 being strongly disagree.

The question "*Do you currently take mineral or vitamin supplements?"* measured Vitamin Intake. Respondents who circled "yes" were coded as 2 while those who answered "no" were coded as 1. The *item "What is the extent to which you intend to take (or keep taking) vitamins in the future?"* measured behavioral Intention to take vitamins and was scaled from 1 *not very strong intent* to 5 *very strong intent*. These items were embedded within other survey items not directly relevant to this analysis (e.g. questions assessing activities, beliefs, and attitudes relevant to having normal healthy babies).

Procedure

Participants received, read, and signed the informed consent prior to taking the survey which took approximately 45 minutes to complete. After taking the survey, participants were individually escorted to an adjacent room where their height and weight were measured. Upon completion of the study participants signed for two $5.00 gift cards each and were given a copy of the informed consent form and an informational sheet containing a list of foods rich in folic acid. The debriefing was included as the final section of the survey and read as follows: "*Thank you for participating in our study. As you know, we are conducting a study that examines psychosocial and nutritional variables related to pregnancy problems among Latino women. Latino women have an alarming rate of babies born with neural tube defects and we hope that our study will provide a better understanding of the attitudes, beliefs, and activities that maximize the*

opportunities for women to have normal healthy babies. We would like to ask you some questions and also give you the opportunity to ask questions." The debriefing assessed the participants' perceived level of comfort with the procedures and study, the clarity of the survey questions, the level of risk produced by the questions and the benefit to society by participating in the survey. The debriefing also invited participants to ask questions of their own.

Analyses to be Performed

In order to answer Hypothesis A, four separate ANOVAs will test for mean differences in Attitudes, Subjective Norm, and PBC, and Intentions between vitamin takers and non-takers.

Assumptions of ANOVA include the following: (a) observations are assumed to be independent of one another; (b) the distributions of scores on the dependent variable are assumed to be normal; and (c) dependent variable distributions are assumed to have equal variances.

To test Hypothesis B multiple regression will assess whether Attitude, Subjective Norm, and PBC significantly predicts behavioral Intention to take vitamins. Careful consideration of predictor regression weights and/or squared partial correlations will determine most significant contributor to behavioral Intention and Vitamin Intake. To answer Hypothesis C, regression will also be utilized to determine if PBC and behavioral Intention to take vitamins predicts subsequent self-reported Vitamin Intake.

CHAPTER III

RESULTS

Preliminary Analyses

Of the 64 participants, 3 surveys were eliminated from the analyses due to incomplete data. A Kolmogorov-Smirnov test was conducted to formally test for a violation in the normality assumption in the Attitude measure. The test revealed a significant p value (p= .010). Therefore, we reject the null hypothesis that the population is distributed normally. However, this violation of normality may be a reflection of the sample size as moderately large N's (i.e. >30) can produce significant results.

A Kolmogorov-Smirnov test was conducted to formally test for a violation in the normality assumption in the Subjective Norm measure and revealed a significant p value (p= .000). Therefore, we reject the null hypothesis that the population is distributed normally. As aforementioned, the sample size was large enough to increase the likelihood of reaching significance.

A Kolmogorov-Smirnov test was conducted to formally test for a violation in the normality assumption in the PBC measure and revealed a marginally significant p value (p= .059). Therefore, we cannot reject the null (the null hypothesis being that the population is distributed normally).

A Kolmogorov-Smirnov test was conducted to formally test for a violation in the normality assumption in the Intention (to take vitamins) measure and revealed a

significant p value (p= .000). Therefore, we reject the null (the null hypothesis being that the population is distributed normally).

In short, all variables but PBC revealed violations in the normality assumption and this is a potential limitation of the study, however, according to Gravetter and Wallnau (as cited in Mertler and Vannatta, 2005), the ANOVA test is relatively robust to violations of the normality assumption. Furthermore, caution must be used in interpretation of violation of normality as the sample size was large enough to increase the likelihood of reaching significance.

To look for violations in homogeneity of variance the Levene test was used. Measures of Intention, SN, and PBC did not reach statistical significance. However the Attitude measure did reach statistical significance (p= .025), therefore, the assumption of homogeneity of variance was violated. In addition, a Crohnbach's alpha was conducted to assess the reliability of items comprising the Attitude composite measure and the PBC measure. The Crohnbach's alphas for the PBC and Attitude measure were .65 and .78, respectively.

Tests of Hypotheses

Hypothesis A: Vitamin takers should (1) have more positive Attitudes towards taking vitamins, (2) perceive more pressure from others to take vitamins, (3) have greater PBC, and (4) have greater Intentions to take vitamins than non-vitamin takers.

In order to test this hypothesis, four separate ANOVAS were conducted to look for mean differences in measures of Attitude, Subjective Norm, PBC, and Intention (to take vitamins) between vitamin takers and non-takers. In order to correct for multiple ANOVAs, the alpha level was set at .03.

ANOVA results, presented in Table 1, showed significant differences between vitamin takers and non-takers on Measures of Subjective Norm ($F(1, 59)=4.905$, $p=.031$), PBC ($F(1,59)=7.322$, $p=.009$), and Intention ($F(1,59)=32.663$, $p=.000$). Subjective Norm scores for vitamin takers ($M=4.12$, $SD=.95$) were greater than non-vitamin takers ($M=3.54$, $SD=1.04$). PBC scores for vitamin takers ($M=4.14$, $SD=.80$) were also greater than non-vitamin takers ($M=3.66$, $SD=.59$). Intention scores for vitamin takers ($M=4.42$, $SD=.65$) were greater than Intention scores for non-vitamin takers ($M=2.97$, $SD=1.12$). There were no statistically significant differences in Attitude measures between the two groups (See Table 1).

Table 1
Mean Scores of Attitude, Subjective Norm, and PBC Measures of Vitamin Takers and Non-Takers

Status	Mean	SD
Vitamin Takers		
Attitude	1.56	.45
Subjective Norm	4.12*	.95
PBC	4.14**	.80
Intention	4.42**	.65
Non Vitamin Takers		
Attitude	1.81	.72
Subjective Norm	3.54*	1.04
PBC	3.66**	.59
Intention	2.97**	1.12

Note: *p < .03. **p < .01

Hypothesis B: Attitude, Subjective Norm, and PBC will predict Intention to take vitamins.

In order to ascertain whether Attitude (towards vitamin intake), Subjective Norm, and PBC predict Intention, a stepwise regression was conducted. Individual contributions of each variable as well as the combined contributions of all three predictor variables on Intention were examined using the stepwise regression model. The three independent variables combined accounted for 35.5% of the variance. The full model (with Attitude, Subjective Norm, and PBC remaining in the stepwise regression model) was statistically significant. Therefore, we reject the null that R squared is equal to zero.

Subjective Norm was the first predictor to enter the stepwise regression model and uniquely accounted for 11.9% of Intention variance. PBC entered the model next and uniquely accounted for a 6.1% of Intention variance. The Attitude measure entered the model last and uniquely accounted for 5.9% of Intention variance. The common variance attributable to measures of Attitude, Subjective Norm, and PBC working together accounted for 11.6% of Intention variance (See Table 2 and Table 3).

Table 2
ANOVA Summary Table for Hypothesis B

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18.450	1	18.450	16.321	.000
	Residual	66.697	59	1.130		
	Total	85.148	60			
2	Regression	25.274	2	12.637	12.241	.000
	Residual	59.874	58	1.032		
	Total	85.148	60			
3	Regression	30.256	3	10.085	10.473	.000
	Residual	54.891	57	.963		
	Total	85.148	60			

a. Predictors: (Constant), Subjective Norm
b. Predictors: (Constant), Subjective Norm, PBC
c. Predictors: (Constant), Subjective Norm, PBC, Attitude
d. Dependent Variable: Intention

Table 3
Summary of Stepwise Regression Analysis for Variables Predicting Intention to Take Vitamins (N = 61)

Variable	B	SE B	Beta
Step 1			
Subjective Norm	.534	.132	.465
Step 2			
Subjective Norm	.502	.127	.438
PBC	.476	.185	.284
Step 3			
Subjective Norm	.416	.128	.363
PBC	.418	.181	.250
Attitude	.481	.211	.257

Note: R Squared = .22 for Step 1; R Squared = .30 for Step 2; R Squared = .36 for Step 3 (*ps* = .000).

Hypothesis C: PBC and Intention will predict self-reported vitamin intake.

This study also used a stepwise regression model to examine the individual and combined contributions of Attitude, Subjective Norm, PBC, and Intention to take vitamins, with respect to predicting Vitamin Intake. Only Intention to take vitamins remained in the stepwise regression model and was statistically significant. Therefore, we reject the null that R squared is equal to zero. Intention accounted for 35.6% of the variance, and it equaled the overall vitamin intake variance of 35.6% (See Table 4 and 5).

Table 4
ANOVA Summary Table for Hypothesis C

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.187	1	5.187	32.663	.000
	Residual	9.370	59	.159		
	Total	14.557	60			

a. Predictors: (Constant), Intention
b. Dependent Variable: Self-reported Vitamin Intake

Table 5
Summary of Stepwise Regression Analysis for Variables Predicting Self-Reported Vitamin Intake (N = 61)

Variable	B	SE B	Beta
Step 1			
Intention	.247	.043	.597

Note: R Squared = .36 (p = .000).

CHAPTER IV

DISCUSSION

In general, partial support was found for Hypotheses A and C while the data completely supported Hypothesis B. Vitamin takers had significantly higher mean scores on Subjective Norm, PBC, and Intention measures. However, no significant differences were found between vitamin takers and non-takers on Attitudes towards vitamins.

These results are mostly consistent with past studies that explored differences in TPB constructs between vitamin takers and non-takers. For example, Conner et al. (2001; 2003) also found supplement users perceived greater normative pressure towards using supplements, reported higher rates of PBC, and had greater Intentions to use supplements relative to non-takers. Furthermore, Pawlak et al. (2007) found significant differences between multivitamin users and non-users on measures of Intention to take vitamins.

Unlike the results found in Conner et al. (2001; 2003), no significant differences were found between vitamin takers and non-takers on measures of Attitude towards vitamins. Perhaps, in Hispanics, Attitudes are less important in the initiation and maintenance of vitamin intake than in White populations. Recall that, among White college females and women living in the UK, Attitude (towards vitamin/supplement use) exhibited the greater influence on Intention to use vitamins/supplements (Conner, 2003;

Pawlak et al., 2007). By contrast, past studies examining TPB constructs in Hispanic populations suggest Subjective Norm to be a stronger predictor of intentions (relative to Attitude and PBC) in the process of making important life decisions. For example, Flores, Tschann, & Marin (2002) found that among Hispanic females, social norm perceptions, but not attitude, predicted intentions to engage in sexual activity. Another study, consisting primarily of African Americans (18%) and Hispanic (69%) females, used an adapted version of the TPB model dubbed the Expanded Rational Expectations and Intentions (EREI) Model and measured intentions to breastfeed. In addition to exploring factors contributing to Attitude and Subjective Norm, Hill et al. (2008) found that intentions to breastfeed were positively influenced by subjective norm ($p < .05$), but not by Attitude. Thus, the current research suggests that it may be particularly beneficial to target Subjective Norm influences in Hispanics when developing intervention strategies to decrease the prevalence of NTDs.

The increased salience of SN may reflect a more collectivistic orientation in Hispanics (relative to Whites) and may explain, in part, the greater influence of Subjective Norm components in their decision to use multivitamins. Research shows that collectivistic individuals are more likely to conform, to consider the consequences of not conforming, to consider the impact their actions have on others, and to search for shared solutions in personal relationships (Kim & Markus, 1999; Triandis, 1994; Yamagishi, 1994). Freeberg & Stein (as cited in Coon & Kemmelmeier, 2001) found a higher degree of collectivism in Hispanics when compared to European Americans. Other studies suggest collectivism may be more prominent in minority groups. For example, Gaines et al. (as cited in Coon & Kemmelmeier, 2001) found that minorities from the United States

scored higher on collectivism scales relative to European Americans when considered as a whole. In addition, Matsumoto et al. (as cited in Coon & Kemmelmeier, 2001) found a greater degree of collectivism in Asian, African, and Hispanics when compared to European Americans in family and friend contexts. Thus, the literature suggests that Hispanics may be heavily influenced by those with whom they form relationships, especially in the context of family and friends. This may explain the stronger effect of SN (relative to Attitudes) on Intention to take vitamins observed in this study.

Hypothesis B was also supported. Attitude, Subjective Norm, and PBC predicted Intention to take vitamins. These results are what would be expected from Ajzen's model. Not surprising, Subjective Norm influences were the greatest contributor to Intention (to take vitamins) variance. Lastly, Hypothesis C was partially supported. Only Intention to take vitamin significantly predicted Vitamin Intake, and was the only construct that remained in the stepwise regression analysis. These results suggest that Intention to take vitamins mediated the effect of PBC on Vitamin Intake. Contrary to what Ajzen's model predicted PBC did not have direct effect on Vitamin Intake.

In Ajzen's model, Intention is thought to have direct effects on behavior while PBC is thought to have both direct and mediated (through intention) effects on behavior. In the current study only Intention predicted vitamin intake. Perhaps, PBC's weak link with Vitamin Intake may be explained by participants' fatalistic beliefs that events and outcomes are predetermined and outside of one's control. For example, it would make little sense to take vitamins in an attempt to prevent an NTD-affected pregnancy if these events are believed to be under the influence of "God's will."

Contributions, Limitations, and Future Directions

This study is important because motivating women of childbearing age to intentionally maintain adequate folic acid levels (i.e. via vitamin intake) is the single most effective means for preventing NTDs. And because NTD rates are alarmingly high in Hispanics it is imperative to ascertain predictors that would lead to establishing a regular regimen of folic acid intake through a daily multivitamin.

In addition, this study is novel because the TPB has not previously been applied in a Hispanic population in regards to measuring vitamin intake and intention to take vitamins. The TPB model has, however, been used to explore vitamin and supplement use in African American and White populations. This study, when considered in the light of past studies, helps clarify the relative role Attitudes, Subjective Norm influences, and PBC have in predicting Intention to take vitamins and may provide important information for the development of an ethnic-specific intervention in Hispanic women. For example, by identifying the most relevant TPB constructs in Hispanic women, tailored interventions that can reduce NTD rates by increasing folic acid/vitamin adherence can be introduced.

Future studies may consider using ethnically diverse samples to further explore the relative contributions of TPB constructs within and between these groups. In this way, future studies can further elucidate the role of various constructs in Ajzen's TPB model among different populations. This knowledge can then be used to emphasize the most appropriate construct within a population that will promote the healthy habit of a daily multivitamin.

There are several limitations of the study worth noting. One, this study had a limited number of participants. Of the 64 participants taking surveys 3 were eliminated (due to incomplete data) leaving 61 for the analyses. A Small N amounts to a lack of power, which increases the likelihood of committing a Type II error.

Two, the Crohnbach's alpha for items comprising the PBC composite measure was moderate (.648). This may be a reflection that the items comprising PBC are measuring slightly different constructs. For example, Ajzen (2006) proposes that there are two facets of PBC. The first facet refers to one's perceived *capability* of performing a particular behavior. The other refers to one's *controllability* over the behavior. The item, "*Taking vitamins everyday is something that is easy for me to do*" and the item "*I am confident that I will be able to take vitamins everyday*" may refer to the *capability* aspect of PBC. On the other hand, the items, "*I do not have much control over whether or not I can take vitamins everyday*" and "*There are many obstacles that would prevent me from taking vitamins everyday*" may refer to the *controllability* aspect of PBC. The fact that, in the current study, these items comprise one PBC measure may explain the low Crohnbach's alpha.

Three, Intention to take vitamins and Vitamin Intake were each measured with one item. A one-item measure may lack validity and may not sufficiently measure the construct. Four, actual vitamin intake was not measured as only self-reported vitamin intake was obtained. This may or may not be an accurate reflection of reality. Even though the questions were not asked directly, the respondents may be attempting to "please" the researchers by reporting themselves as vitamin takers or may be providing answers based on what they think they should be doing (e.g. taking vitamins).

Five, the degree to which the findings in this sample of Hispanic college females can generalize to the Hispanic population of women as a whole may be a cause of concern. However, having an education doesn't negate the degree to which participants are representative of the Hispanic population. Furthermore, having a strong cultural foundation and being college educated are by no means mutually exclusive. Therefore, it is reasonable to expect that college educated Hispanic females may be representative of Hispanic females as a whole.

A noteworthy limitation of the study, and of the TPB model in general, has to do with the finding that the TPB model may be more successful in predicting self-reported behavior than actual behavior. A recent meta-analysis of Ajzen's TPB by Armitage & Conner (2001) found that a review of the literature provided substantial support for using Ajzen's model to predict intention and behavior. However, the "prediction of self-reported behaviors is superior to observed behavior." Furthermore, intentions often account for only a small to moderate amount of variance in behavior. It has been suggested that the TPB is more appropriate for motivating an individual towards intention rather than action and says little about how intentions are translated into a particular behavior. Models such as the Health Action Process Approach (HAPA) model and Gollwitzer's Implementation Intentions help clarify the processes by which intentions are translated into action.

Furthermore, research suggests that different intervention strategies may be needed depending on an individual's intention strength or their degree of "action-readiness." For example, those who are unaware a problem exists (e.g. risk of NTD affected birth) may benefit more from interventions conveying risk information whereas

those who are aware of the problem/risk but have no intentions (e.g. to take vitamins/ folic acid) may benefit more from interventions that increase PBC, positive attitudes, and perceptions of subjective norm. Interventions such as these are likely to further increase commitment, motivation, and intentions of the desired behavior. For those already properly motivated to change their behaviors, "volitional" strategies such as Gollwitzer's Implementation Intentions may be more appropriate in translating intentions into action by aiding in the initiation and maintenance the desired behavior.

So how might interventions based on Ajzen's TPB model be successfully applied to Hispanic populations? Several considerations must be taken into account when addressing this concern. First, an emphasis on conveying information about risk factors associated with NTDs would be a good place to start, however, those greatest at risk for an NTD-affected pregnancy are the least likely to seek help. Therefore, active recruitment efforts targeting high-risk groups would be crucial. No conclusions about successful outcomes can be drawn until representative samples of Hispanic women are included in an intervention. For example, a study by Felkner, Suarez, Hendricks, & Larsen (2005) concluded that their intervention was successful in preventing NTDs in a group of women with a prior NTD-affected pregnancy. However, the outcome might not have been as successful as the authors suggest. Perhaps, these women were already motivated to prevent another NTD-affected pregnancy due to their prior experience with one. Therefore, it is likely that women who have had an NTD-affected pregnancy do not adequately represent the entire at-risk population. In short, efforts need to be made to reach less knowledgeable and less motivated individuals.

Second, once risk information is conveyed to actively-recruited participants, efforts should be made to increase participants' perceptions of control over taking vitamins. This may be accomplished by helping participants find solutions to overcome perceived barriers towards taking vitamins.

Third, a family-oriented intervention that aims to increase positive perceptions of taking vitamins and/or folic acid is likely to greatly increase motivation and adherence to a daily multivitamin regimen. And, as our research suggests, targeting Subjective Norm influences may be particularly beneficial in this population. In short, these considerations can guide the application of Ajzen's TPB model to successful interventions. Specifically, PBC may be increased by emphasizing biomedical causes of disease. This would help foster the belief that taking folic-acid containing vitamins would decrease their likelihood of an NTD-affected pregnancy. In addition, including the entire family in an intervention effort (by making them aware of an increased NTD risk) may help motivate and remind mothers to maintain adequate folic acid levels by increasing vitamin intake.

Hopefully, this study, and future studies can contribute to our understanding of the relative contributions of predictors of intention to take vitamins and vitamin intake in ethnically diverse samples. Population-specific interventions that are empirically-driven can do much to prevent the prevalence of NTDs by helping individuals move along the motivational-volitional continuum towards the healthy habit of maintaining proper folic acid intake through vitamin consumption. Only by ascertaining the differential impact of constructs in Ajzen's TPB model may we determine if tailored interventions may add

additional benefit above and beyond trans-cultural interventions designed to increase folic acid adherence.

APPENDIX A

Consent Form (IRB # - 2008-86186)

Professor Roque V. Mendez (e-mail rm04@txstate.edu or at 512-245-2526), Texas State University Department of Psychology is conducting a research investigation. The purpose of this research is to examine your attitudes, beliefs and knowledge about maximizing your opportunity for having a perfectly normal, healthy baby. This research study requires about 45-60 minutes. Upon completion of the study, you will receive a $10 gift certificate of your choice from HEB or Wal-Mart as compensation for completing the study.

If participating in a study about maximizing your opportunity for having a perfectly normal, healthy baby *makes you feel uncomfortable for any reason, do not participate* If you decide to participate, you will be asked some biographical and family information, including any past pregnancies, pregnancy loss, and whether or not you use contraceptives. You will be weighed and your height measured. You will be asked to provide written comments and numerical ratings about family and social support, women you know who have had normal, healthy babies and any those having babies born with problems, your desire and timeline for having your own baby or another one, actions you may plan preparing for a baby; persons and places where you could seek advice; your own estimates of your weight, height, health, nutrition, typical groceries you buy, exercise, vitamins in foods and vitamin supplements, both now, before and during a possible, future pregnancy; knowledge about family planning; and your sources of information about certain birth complications and how to help prevent them. You are not under any obligation to participate and you have the right to withdraw from the research at any time. Your participation is voluntary and refusing to participate will involve no penalty. You may discontinue participation at any time without penalty.

This is an anonymous survey and individual responses will never be revealed to anyone. Nor will your name appear in any part of the survey. Additionally, the results will only be reported in aggregate. To affirm your understanding of your rights as a participant in this study and your willingness to participate you must read, understand this consent form and provide your name and signature only on the consent form. The consent forms will be collected separately from the surveys thus ensuring your anonymity. Participants' names will, therefore, not appear on the survey and your responses will never be matched to you. The questionnaires collected from this study will be stored in the psychology building for a period of no more than five years.

As a potential participant, you were instructed in paragraph two not to participate should you feel that participation would be distressing for you. However, in the event that any participant might experience unanticipated distress, the contact information for the University Counseling Center is http://www.counseling.txstate.edu/intro.html. Approximately 15 Counselors are available at this link: http://peoplesearch.txstate.edu/peoplesearch.pl?query=department%3D%22Counseling+Center%22&srchmode=search The email address is counselingcenter@txstate.edu . Moreover, this research has been approved by the Institutional Review Board (IRB) and if you have any questions about the research, research participant's rights and research related injuries to participants, you should direct them to the IRB chairperson, Dr. Lisa Lloyd (512-245-8358), and to the OSP Administrator, Ms. Becky Northcutt (512-245-2102).

At the conclusion of the study, you will be debriefed and informed about the exact questions the study examined and what anticipated results may occur. You will be asked to describe and assess any possible risks and benefits that occurred for you in the study. The results of the study will be made

available through (1) your instructor's postings and (2) postings outside my office in the psychology building, 212C.

We believe that there are minimal risks in doing this research. You may feel uncomfortable by some of the questions if you or someone close to you has had any complications in a prior pregnancy. You may also feel uncomfortable disclosing your weight, age and socio-economic level. Nevertheless, your participation in this research has benefits. First, our small gift to you is in appreciation for your contribution. Moreover, you may gain an appreciation for how research that has implications for improving the health of women is done. Most importantly, we believe that you and many women like you benefit indirectly through your participation. The information that you and other participants provide, in aggregate, will help women, researchers and society gain a better understanding of how to prevent birth defects. In the event that you have any questions, please contact the principal investigator, Roque V. Mendez: e-mail rm04@txstate.edu or at 512-245-2526. You will be provided with a copy of this signed informed consent form.

Thank you, Roque V. Mendez, Ph.D.

I have read and understand this consent form. I voluntarily agree to participate in the research.

Your Name (Printed)	Your Signature	Date

APPENDIX B

Survey Instrument

38. We would like to know what your feelings are about vitamins. Below are pairs of adjectives that are opposites of each other. Checkmark the space between each of the seven pairs of opposites that reflects your feelings about vitamins.

Good	__ __ __ __ __ __	Bad
Pleasant	__ __ __ __ __ __	Unpleasant
Healthy	__ __ __ __ __ __	Unhealthy
Nice	__ __ __ __ __ __	Nasty
Important	__ __ __ __ __ __	Unimportant
Useful	__ __ __ __ __ __	Useless

40. What is the extent to which you intend to take (or keep taking) vitamins in the future?

A. Very strong intent
B. Strong intent
C. Intent
D. Not strong intent
E. Not very strong intent

41. Most people whose opinion matters to me think that I should take vitamins.

1	2	3	4	5
Strongly Disagree	Disagree		Agree	Strongly Agree

42. Taking vitamins everyday is something that is easy for me to do.

1	2	3	4	5
Strongly Disagree	Disagree		Agree	Strongly Agree

43. There are many obstacles that would prevent me from taking vitamin every day.

1	2	3	4	5
Strongly Disagree	Disagree		Agree	Strongly Agree

44. I do not have much control over whether or not I can take vitamins every day.

1	2	3	4	5
Strongly Disagree	Disagree		Agree	Strongly Agree

45. I am confident that I will be able to take vitamins every day.

1	2	3	4	5
Strongly Disagree	Disagree		Agree	Strongly Agree

REFERENCES

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes,* 50(2), 179-211.

Bogers, R., Brug, J., Assema, P., Dagnelie, P. (2004). Explaining fruit and vegetable consumption: the theory of planned behavior and misconception of personal intake levels. *Appetite*, 42(2), 157-166.

Center for Disease Control. (n.d.). The prevention of neural tube defects with folic acid. Retrieved August 25, 2008 from http://www.cdc.gov/ncbddd/folicacid/documents/ntd_dave.pdf.

Centers for Disease Control. (2007). Use of supplements containing folic acid among women of childbearing age in the United States. *Mortality and Morbidity Weekly Report*. Retrieved August 25, 2008 from http://www.cdc.gov/media/mmwrnews/2008/n080110.htm.

Conner, M., Kirk, S., Cade, J., Barrett, J. (2003). Environmental influences: factors influencing a woman's decision to use dietary supplements. *The Journal for Nutrition,* 1978-1983.

Conner, M., Kirk, S., Cade, J., Barrett, J. (2001). Why do women use dietary supplements?: the use and theory of planned behavior to explore beliefs about their use. *Social Science and Medicine*, 52, 621-633.

Coon, H.M., & Kemmelmeier, M. (2001). Cultural orientations in the United States: (re)examining differences among ethnic groups. *Journal of Cross-cultural Psychology, 32*, 348-364.

Felkner, M., Suarez, L., Hendricks, K., Larsen, R. (2005). Implementation and outcomes of recommended folic acid supplementation in Mexican-American women with prior neural tube defect-affected pregnancies. *Preventive Medicine, 40*, 867-871.

Gollwitzer, P. (1999). Implementation intentions: strong effects of simple plans. *American Psychologist,* 54(7), 493-503.

Hagger, M., Chatzisarantis, N. (2005). First and higher-order models of attitudes, normative influence, and perceived behavioral control in the theory of planned behavior. *British Journal of Social Psychology*, 44, 513-535.

Hasenau, S. (2006). *The effect on behavioral intention of an educational intervention to prevent neural tube defects.* Unpublished doctoral dissertation, Wayne State University, Detroit, Michigan.

Honein, M.A., Paulozzi, L.J., Mathews, T.J., Erickson, J.D., Wong, L.C. (2001). Impact of folic acid fortification of the US food supply on the occurrence of neural tube defects. *JAMA, 285*(23), 2981-2986.

Kim, H.S., & Markus, H.R. (1999). Deviance or uniqueness, harmony or conformity? a cultural analysis. *Journal of Personality and Social Psychology*, 77, 785-800.

Pawlak, R., Connel, R., Brown, D., Meyer, M., Yadrick, K. (2005). Predictors of multivitamin supplement use among African-American female students: a prospective study utilizing the theory of planned behavior. *Ethnicity and Disease,* 15(4), 540-547.

Pawlak, R., Brown, D., Meyer, M., Connel, C., Yadrick, L., Johnson, J. et al. (2007). Theory of planned behavior and multivitamin supplement use in Caucasian college females. *Journal of Primary Prevention.*

Sheeran, P., Orbell, S. (1999). Implementation intentions and repeated behavior: augmenting the predictive validity of the theory of planned behavior. *European Journal of Social Psychology,* 29, 349-369.

Texas Dept. of State Health Services (2008). Texas Neural Tube Defect Project Findings. *Epilink, 65*(1), 1-7. Retrieved March 17, 2009, from http://www.dshs.state.tx.us/idcu/epilink/volume_65/issue_1/Docs/65_01_04.pdf.

Triandis, H.C. (1994). *Culture and Social Behavior*. New York: McGraw-Hill.

Winkels, R.M., Brouwer, I.A., Siebelink, E., Katan, M.B., Verhoef, P. (2007) Bioavailability of food folates is 80% of that of folic acid. *American Journal of Clinical Nutrition, 85*, 465-473.

Yamagishi, Tl, & Yamagishi, M. (1994). Trust and commitment in the United States and Japan. *Motivation and Emotion*, 18, 9-66.

Ziebland, S., Thorogood, M., Yudkin, P., Jones, L., Coulter, A. (1997). Lack of Willpower or lack of wherewithal? Internal and external barriers to changing Diet and exercise in a three year follow-up of participants in a health check. *Social Science Medicine,* 46(4-5), 461-465.

VITA

Kevin Michael Gutierrez was born in Laredo, Texas on October 4, 1982, the son of Armando Gutierrez and Cynthia Sanchez. After completing his work at Alexander High School, Texas in 2001, he entered Texas State University–San Marcos. He received a Bachelor of Science in Psychology from Texas State in May 2007. In August 2007 he entered the Graduate College of Texas State to study Health Psychology.

Permanent Address: 2816 Don Sergio

Laredo, Texas 78045

This thesis was typed by Kevin M. Gutierrez.