UNDERSTANDING ADOLESCENT SEXUALLY ABSTINENT BEHAVIOR AND INTENTIONS THROUGH STRUCTURAL EQUATION MODELING AND USE OF THE INTEGRATED THEORY

A Dissertation

by

ERIC RICHARD BUHI

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2006

Major Subject: Health Education

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Approved by:

Chair of Committee,	Patricia Goodson
Committee Members,	B.E. (Buzz) Pruitt
	Steve Dorman
	Victor Willson
	Torsten Neilands
Head of Department,	Steve Dorman

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ABSTRACT

Understanding Adolescent Sexually Abstinent Behavior and Intentions through Structural Equation Modeling and Use of the Integrated Theory. (May 2006)

Eric Richard Buhi, B.A, University of Florida;

M.P.H., Indiana University

Chair of Advisory Committee: Dr. Patricia Goodson

Adolescent sex research, historically, has suffered from 4 limitations: a lack of theoretical grounding to guide the development of hypotheses (in individual studies); the absence of a multidimensional theoretical model on sexual behavior; use of simple univariate/bivariate analytic techniques; and little systematic study of *sexual abstinence*. These remain important limitations, as the federal government has increased its allocation of millions of dollars annually for abstinence-promotion programs and 1 in 5 US teens still report having had sexual intercourse before the age of 15. The purpose of this dissertation study was to utilize structural equation modeling to 1) test The Integrated Theory in explaining adolescents' sexually abstinent behavior and intentions to remain abstinent before marriage, and 2) refine the theory to reflect which elements contribute more powerfully to the explanation of adolescents' behavior and intentions.

An anonymous, theory-based paper-and-pencil questionnaire was administered to 2 non-random samples of $7^{th}/8^{th}$ grade youth (Wave 1 N = 451, Wave 2 N = 448), taking

part in a broader evaluation study of Title V-funded abstinence-only-until-marriage education programs in Texas. The questionnaire assessed adolescent's self-reported sexual behaviors, intentions to remain abstinent, environmental constraints, beliefs, subjective norms, pro-abstinence self-standards, emotions regarding sexual abstinence and sex before marriage, and self-efficacy.

Measurement modeling provided sufficient evidence for establishing construct validity. Initial structural model fit (Wave 2 data) was satisfactory; however, a refined model demonstrated better fit, yielding a χ^2/df ratio of 3.16, CFI/TLI values of 0.73/0.95, and RMSEA and WRMR values of 0.07 and 0.86, respectively. Greater endorsement of abstinence-related standards predicted stronger beliefs toward staying abstinent, stronger perceptions that others endorse pro-abstinence norms, and a greater self-efficacy to remain abstinent until marriage. In turn, beliefs, perceived norms, and self-efficacy were predictive of intentions (β = .379, .300, and .273, respectively, $p \leq .001$). I found similar findings in a second modeling analysis (replication) using a second but similar set of sample data (from Wave 1).

Results indicate The Integrated Theory may be useful in explaining adolescents' intention to remain abstinent and their subsequent abstinent behavior. I identify several implications for future study and health education practice.

ACKNOWLEDGMENTS

My engagement in, and completion of, this dissertation study would not have been possible without the support, guidance, and mentoring from several important individuals. First, I thank Dr. Steve Dorman for recruiting me to come to Texas A&M University in 2002. Dr. Dorman has since served for me as a significant advocate and mentor in my studies. Second, I owe a debt of gratitude to Dr. Buzz Pruitt who has helped me (among other things) become a better communicator of complex and technical material (structural equation modeling [SEM]). I thank Dr. Tortsen Neilands for his countless hours of teaching and mentoring—all over the telephone and through e-mail. He, always, graciously answered my questions (in depth) and provided insight on how to "do SEM" and work with M*plus*. I also thank Dr. Victor Willson for introducing SEM to me through his EPSY 690 class. Dr. Patricia Goodson has made the greatest professional impact on me. I thank her for taking me on as a doctoral student and challenging me on everything I do. Through my work with Dr. Goodson, I have become a better writer, researcher, teacher, and critical thinker. I hope that I am able to serve graduate students in the way she has mentored me. Lastly and most importantly, I thank my wife and best friend, Lori Keeling Buhi, who has been unwavering in her support of me over the past four years. Lori has been my one of my most critical (and helpful) reviewers, she has served as a sounding board for some of my crazy ideas, and I hope she knows that her love and support will pay off in moving us on to bigger and better things!

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CHAPTER I

INTRODUCTION

The purpose of this dissertation is three-fold. In a manuscript-style format (rather than the traditional five-chapter dissertation layout), I present three "free-standing" pieces: 1) a primer on structural equation modeling (SEM) intended for health behavior researchers; 2) results from a SEM analysis of adolescent sexually abstinent behavior and intention to remain abstinent, guided by The Integrated Theory (Fishbein, 2000; Fishbein, Triandis, Kanfer, Becker, Middlestadt & Eichler, 2001), and 3) results from a systematic review of the literature on predictors of adolescent sexual behavior and intention, again, guided by The Integrated Theory.

Identifying antecedents of adolescents' initiation of sexual intercourse has been a topic of special interest for many scholars, educators, policy-makers, and parents. However, while much inquiry has taken place pertaining to the correlates of *engaging* in sexual intercourse, very little research has been conducted to investigate why adolescents *postpone* sexual intercourse, or why they choose to remain sexually abstinent until later ages. These remain important unanswered questions, since the Welfare Reform was legislated by Congress and signed by President Clinton in 1996 (Public Law 105-33)[1], providing millions of dollars annually for abstinence-only-until-marriage education programs. Prevention programs may be more apt to influence the

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This dissertation follows the style of *The Journal of Sex Research*.

[1] Public Law 105-33. Balanced Budget Act of 1997, Subtitle 5001, Section a. August 5, 1997.

sexual behavior of youth participants by tailoring their educational approaches based on solid research. This dissertation study attempts to add to this body of research by testing elements, outlined in The Integrated Theory, which may explain much of the variance in adolescents' sexually abstinent behavior.

Following the style guidelines published in the fifth edition of the *Publication Manual of the American Psychological Association*, I have organized this document into five chapters (with chapters II-IV intended to "stand alone" as manuscripts to be submitted for scholarly publication) and two appendixes. In this first chapter I provide an overall introduction to the content which follows. Chapter II contains a primer on SEM intended for health behavior researchers. The purpose of the primer is to introduce—or update, depending upon the reader's familiarity—the state-of-the-art in SEM as a multivariate analytic technique in health behavior research. The primer is organized in a manner allowing readers to review any one of five free-standing subsections most pertinent to their needs or knowledge level. In subsection one of the primer, I define the purpose of SEM, and in subsection two I present SEM's strengths as a multivariate analytic tool. For those unfamiliar with "how to do SEM," subsections three and four are particularly helpful. In subsection three, I provide an overview of the basic steps involved in conducting SEM analyses; in the fourth subsection, cautionary notes related to using SEM. Finally, in subsection five, I review a host of available resources and provide a comparative treatment of SEM software packages. That concluding subsection may prove useful for beginners and seasoned "SEMers" alike. It

may be most helpful for researchers seeking analytic materials or programs that can aid in SEM analyses.[2]

Chapter III presents the results from an analysis of adolescent sexually abstinent behavior and intentions through SEM and use of The Integrated Theory. Adolescent sex research, historically, has suffered from four notable limitations. First, many studies completely lack a theoretical grounding or fail to utilize a theoretical framework to guide the development of hypotheses. Second, when researchers do employ a theoretical framework to guide their study, there are numerous health behavior or social science theories from which they choose (Moore & Sugland, 1997), and no one comprehensive, multidimensional theoretical model on adolescent sexual behavior prevails (Nitz, 1999). Third, most researchers would acknowledge that adolescent sexual behavior is complex and multifaceted (Moore, Miller, Glei, & Morrison, 1995), however, much of the research into predictors of this behavior has neglected the use of multivariate analytic techniques, employing instead simple *univariate/bivariate* methods (Buhi & Goodson, 2006; Goodson, et al., 1997). Fourth, although research has provided great insight into the many factors that correlate with early sexual initiation, as noted above, there has not been much systematic study regarding *sexual abstinence* among adolescents. That is, we do not know much about *why* youth remain sexually abstinent or *why* they postpone intercourse until later ages (Dunsmore, 2005; Rasberry, 2006). As noted above, these

[2] After several rounds of useful feedback (from my doctoral dissertation committee) and revision, I submitted the SEM primer for publication in the *American Journal of Health Behavior*, on December 7, 2005. The primer was returned to me with a revise and resubmit disposition from the editor, accompanied by reviewer comments, on January 6, 2006. I re-submitted a revised manuscript to the *American Journal of Health Behavior* on February 3, 2006, and was notified on February 11, 2006 that the manuscript had been accepted for publication pending minor formatting revisions.

remain important unanswered questions, as the federal government has increased its allocation of millions of dollars each year for abstinence-promotion programs (National Campaign to Prevent Teen Pregnancy, 2005b).

My purpose in the study presented in Chapter III was to utilize SEM analyses to a) test the "fit" of an integrative theoretical framework—termed "The Integrated Theory"—with middle school youth data collected as part of a broader evaluation study of Title V-funded abstinence-only-until-marriage education programs in Texas, and b) refine the theory to reflect which elements contribute more powerfully to the explanation of adolescents' sexually abstinent behavior and intentions. My specific research questions were:

1. Is The Integrated Theory adequate for explaining middle schoolers' intentions to remain sexually abstinent and their sexually abstinent behavior?
2. If The Integrated Theory is *not* adequate, what is the adequacy of a refined model in explaining middle schoolers' intentions and sexually abstinent behavior?
3. Does a model with adequate fit replicate (or, does it "hold") when tested against a second set of youth sample data? In other words, how robust is this model?

4. Which variables in The Integrated Theory are the best predictors of students' intentions to remain sexually abstinent and, thus, the best candidates for intervention/programming foci?

Chapter IV presents the results from a systematic review of the literature. The purpose of the review was: 1) to summarize empirical findings concerning predictors of adolescent sexual behavior and intention, published between 1996 and 2005, using a multidimensional theoretical framework (The Integrated Theory) as a guide; and 2) to assess this literature's methodological quality. To date, few systematic reviews have been conducted regarding the predictors of adolescent sexual behavior and intention, and even fewer have examined the methodological quality of this literature. Therefore, much uncertainty remains, in terms of the validity and reliability of the findings that have been uncovered so far. The review in Chapter IV contributes to the literature by addressing this uncertainty. Following systematic review procedures, I searched four electronic databases using variations and Boolean connections of sexual behavior terms and the eight key elements outlined in The Integrated Theory. Sixty-nine (N = 69) publications met my inclusion/exclusion criteria and represented the final sample.

Chapter V provides a conclusion to this dissertation project as a whole, based on the structural equation modeling analyses and systematic review of the literature. Chapter V is followed by appendixes, which provide further detail on the analyses described in this dissertation. Appendixes include Appendix A (M*plus* Final Measurement Model Syntax) and Appendix B (M*plus* Final Measurement and Structural Model Syntax).

CHAPTER II

STRUCTURAL EQUATION MODELING: A PRIMER FOR HEALTH BEHAVIOR RESEARCHERS

Introduction

Structural equation modeling (SEM) is a powerful multivariate statistical method being used in the social sciences with increasing frequency (Hershberger, 2003; Tremblay & Gardner, 1996). In the psychological literature SEM citations have risen since 1979 (see Figure on p. 29); SEM now rivals analysis of variance (ANOVA) in statistical method popularity (Nachtigall, Kroehne, Funke, & Steyer, 2003). In health behavior research, however, SEM has yet to reach such popularity.

In an electronic search of articles published between 1996 and 2004 in three health behavior research journals, we found only seven reports in the *American Journal of Health Behavior*, five in the *American Journal of Health Promotion*, and seven in *Health Education and Behavior* which utilized SEM (see Table on p. 26). This amounted to approximately 1 in 53 data-based journal articles, using SEM. Furthermore, only a fraction of the journals' reports used some other multivariate technique, such as multivariate analysis of variance (MANOVA) or canonical correlation analysis (CCA) (see Table on p. 26).

According to the American Academy of Health Behavior Work Group on Doctoral Research Training (2005), "A working knowledge of multivariate statistical procedures is crucial for generating high quality research and answering complex

questions" (p. 554). Why, then, are health behavior and health promotion researchers not going beyond *univariate/bivariate* procedures, such as ANOVA and regression in their research efforts? Although it is beyond the scope of the current paper to fully answer this question, we speculate there may be three reasons.

First, some researchers may not know *why* SEM is particularly useful or valuable. Because SEM is a relatively new tool, classes and trainings addressing SEM's value have only recently been developed. Thus, researchers' knowledge of the assets afforded by SEM, such as the ability to account for measurement error in the modeling process, may be limited. Second, some researchers may not know *how* to conduct SEM. SEM analyses involve a very distinctive nomenclature that can be intimidating for novices. Further, the complexities of models available within SEM analyses are mirrored in complex SEM software packages, which can also be intimidating for the un-initiated analyst. Third, some researchers may not be familiar with resource materials and computer programs available to aid in SEM analyses. The past three decades have been filled with rapid developments in SEM theory and software. For instance, the ability to model dichotomous dependent variables (e.g., ever had sexual intercourse = yes/no) in SEM software packages such as M*plus*, became widely available only within the last few years. Even if an individual took a graduate-level SEM course as recently as five years ago, he/she might not know about these developments.

The purpose of this paper, then, is to introduce—or update, depending upon the reader's familiarity—the state-of-the-art in SEM as a multivariate analytic technique in health behavior research. This primer is organized in a manner allowing readers, both

new and experienced SEM users, to review any one of five free-standing sections most pertinent to their needs or knowledge level. In section one we define the purpose of SEM, and in section two we present SEM's strengths as a multivariate analytic tool. These sections are most useful for individuals questioning *why* SEM might be valuable. For those unfamiliar with "how to do SEM," sections three and four are particularly helpful. In section three, we provide an overview of the basic steps involved in conducting SEM analyses. In the fourth section, we present cautionary notes related to using SEM. Finally, in section five, we review a host of available resources and provide a comparative treatment of SEM software packages. This concluding section may prove useful for beginners and seasoned "SEMers" alike. It will be most helpful for researchers seeking analytic materials or programs that can aid in SEM analyses.

What Is the Purpose of SEM?

Structural equation modeling includes a wide range of multivariate methods aimed at examining the underlying relationships, or structure, among variables in a model. SEM was created to test and refine theoretical models attempting to explain or predict social or behavioral phenomena (Bentler, 1988; Kenny, 1979; Raykov & Marcoulides, 2000). Understanding these phenomena allows us to appreciate "why people engage in health-risk or health-compromising behavior and why (as well as how) they adopt health protective behavior" (Crosby, Kegler, & DiClemente, 2002, p. 1). These theoretical models inform the development and improvement of health-related interventions. Moreover, SEM is a useful tool in estimating these interventions' effects (Short & Hennessy, 1994).

Often referred to as causal, path, latent variable, or covariance structure models, SEM is similar to regression (and other correlational methods) because it belongs to the general linear model (GLM) family. For instance, SEM and regression analyses both rely on a linear combination of variables, use weights (e.g., β weights) to optimize the explained variance and minimize model error variance, focus on latent (or not directly observed) variables, and yield variance-accounted-for effect sizes (e.g., R^2, eta^2; Thompson, 1998, April). In short, SEM subsumes a range of other analytic methods (Bagozzi, Fornell, & Larcker, 1981; Fan, 1997), and may be utilized to conduct both simple analyses (including t-tests, ANOVA, and regression) as well as complex ones, such as multilevel modeling (e.g., examining youth-within-classrooms-within-schools; Bauer, 2003; Hox, 2002) and latent curve modeling (which examines change as a continuous process over time; Hox, 2002).

Why Use SEM?

Although SEM's increased application in the social sciences partially stems from improvements in software packages (Mueller, 1997), we argue such increasing use has been driven by four factors. First, multivariate methods such as SEM best honor the reality to which investigators are attempting to generalize (Thompson, 1994, February). In health behavior research, most outcomes (i.e., behaviors) have multiple causes (i.e., predictors) and most causes have multiple outcomes, all interacting dynamically. Health behavior researchers investigate multivariate, not univariate/bivariate, or isolated, phenomena with only one or two determinants. It is impossible to assess how multiple variables behave in each other's company when a researcher limits an analysis to a

univariate/bivariate examination. Instead, SEM allows *all* variables—multiple independent and dependent variables—to be examined *simultaneously*.

Second, multivariate methods such as SEM control for inflation of experimentwise (EW or Type I) error. Type I error is defined by alpha (α), usually set at .05, and is "…the probability of getting a result…that leads to an incorrect decision to reject the null hypothesis" (Kline, 2004, p. 38). Inflated EW error may occur when a researcher conducts multiple univariate/bivariate tests (i.e., with a single dependent variable or hypothesis, such as in ANOVA) with a single sample's data. These analyses can lead a researcher to falsely reject too many of the hypotheses being tested (Huberty & Morris, 1989). For example, assume a researcher conducts *c* number of tests in a single study (e.g., 20 statistical significance tests), each at α = .05. Using the following formula:

$$\alpha_{EW} = 1 - (1 - \alpha)^c$$

$$\alpha_{EW} = 1 - (1 - .05)^{20} = .64$$

The risk of making a Type I error across the entire set of tests is 64% (Kline, 2004). Further, out of 100 statistical tests conducted, the researcher could be rejecting the null hypothesis, incorrectly, 64 times. In these cases, the probability of making one or more Type I errors can be very serious (see Fish [1988] for examples), and the implications for health behavior research can be sobering. If a researcher conducts multiple univariate/bivariate statistical tests to investigate determinants of an individual's involvement in a health-risk behavior, he/she may erroneously (due to Type I error) conclude that a predictor is associated with the outcome when, in reality, it is

not. Employing multivariate methods such as SEM, however, can correct "up front" for this analytic limitation by avoiding the use of multiple univariate/bivariate tests and, instead, testing hypotheses/research questions across several variables *at once*.

Third, researchers have begun to realize the utility of SEM over other multivariate analytic methods. SEM gives health behavior researchers unparalleled flexibility in specifying theory-driven models that can be tested with empirical data. SEM goes further than older multivariate techniques, such as MANOVA and CCA, by allowing users to automatically and efficiently compute indirect, direct, and total effects in complex models, including models that evaluate statistical mediation where an exogenous predictor variable X impacts an intermediary variable Y that in turn exerts influence on a distal outcome Z. Additionally, unlike these older techniques where the researcher basically "dumps in" all the variables, SEM allows researchers to test theories and assumptions directly by specifying which variables are related to other variables. That is, the researcher can test some paths (or relationships) but not others in the analysis. Some SEM programs even allow researchers to draw these hypothesized relationships visually and fit the drawn model to the underlying data, an intuitive and user-friendly process. Finally, SEM allows researchers to examine relationships among latent variables with multiple observed measures. The relationships among latent variables, thus, are purged of measurement error, leading to more accurate and often stronger relationships between latent variables than what would be observed using multivariate methods that consider observed variables only (e.g., MANOVA or even

regression). In short, while these older techniques assume zero measurement error in sample data (which is never the case), SEM controls for measurement error.

Lastly, SEM is useful because it enables the advanced treatment of incomplete data. Missing data in health behavior research can represent an important problem during analyses. SEM software developers have dealt well with the problem of missing data by incorporating sophisticated missing data techniques—such as optimal full information maximum likelihood (FIML; Arbuckle, 1996; Wothke, 2000)—ahead of the general purpose software vendors (e.g., SPSS, SAS, and Stata). Thus, ANOVA, regression, MANOVA, and ANCOVA can be conducted using SEM programs with or without incomplete data, and a researcher can thereby capitalize on the more sophisticated missing data handling capabilities (see Table on p. 12 which lists SEM software programs capable of conducting FIML or multiple imputation). These capabilities allow researchers to proceed with SEM or other analyses as if there were no missing data, if certain missing data assumptions are met (Allison, 2002; Little & Rubin, 2002).

What Are the Basic Steps of SEM?

In SEM, the researcher utilizes the theoretical literature to specify a health behavior model for testing. The researcher subsequently determines how to measure the variables pertinent to the theory and collects data, for instance, using a survey instrument. Next, he/she passes data to an SEM software package, which fits the data to the specified model and produces results, including model fit statistics and parameter estimates (Research Consulting, ITS, UT, 2001). SEM analyses entail essentially a two-step modeling process (Anderson & Gerbing, 1988) of building and testing 1) a

measurement model and 2) a structural model. Although these two are the *fundamental* analytic steps, there is an additional "up front" step in the analytic process: examining the critical assumption of multivariate normality of the data.

Examining Multivariate Normality

Prior to any analyses, the researcher should test a critical assumption underlying both SEM and other multivariate techniques: the assumption regarding normality of the distribution of multivariate data. Before testing this assumption, however, analysts must first assess univariate normality because, "normality on each of the variables [in a model] separately is a necessary, but not sufficient, condition for multivariate normality to hold" (Stevens, 2002, p. 262). Testing multivariate normality can be accomplished (in both SPSS and SAS) graphically—by examining normal probability plots or Q-Q Plots—or non-graphically—by assessing skewness and kurtosis coefficients, or through statistical testing with the Shapiro-Wilk test.

Once the univariate normality assumption has been evaluated and met, the multivariate normality assumption can be assessed. Because ordinary least squares, generalized least squares, and maximum likelihood statistical estimation theories all presume a multivariate normal distribution, not meeting this assumption can be problematic, particularly when assessing statistical significance (Henson, 1999). In SEM, non-normality can result in an underestimation of overall model fit, downwardly biased parameter estimates, and underestimated standard errors (West, Finch, & Curran, 1995). Many SEM software packages such as EQS and Amos offer multivariate normality tests, such as Mardia's measure of multivariate kurtosis (Mardia & Kanazawa,

1983; Yuan, Lambert, & Fouladi, 2004), which can be carried out with a single mouse click. Recent advances in many packages even make it possible for researchers to analyze non-normal continuous and categorical data (see Table on p. 27).

Using the Two-Step Modeling Approach

Once assumptions are evaluated and met, the researcher may commence with the two-step modeling process of building and testing a 1) measurement model and 2) structural model. First, he/she begins by building and testing the measurement model within the SEM software package. The purpose of the measurement model step is to test indicator/construct relationships. In a psychometric sense, this step is imperative in ascertaining the validity of the constructs. In the Figure on page 30, for example, two sample measurement models (within the narrow dotted boxes) have been formulated using a drawing tool found in one SEM package, Amos. This measurement model's purpose is to take into account measurement error in all variables which are not *directly* observable (e.g., the constructs of behavioral intentions, perceived norms, attitudes, or motivation; Raykov & Marcoulides, 2000). In short, the shared variance derived from the correlations/covariances among multiple observed variables, such as survey items (the boxes in the Figure on p. 30), is used to infer the presence of a common latent factor (the ovals in the model). The software package converts survey data from Excel, SPSS, or raw data (in ASCII text format) into covariances and means which are then used in subsequent analyses (Research Consulting, ITS, UT, 2001). In the Figure on page 30 sample model, the boxes—items E1-E6, N1-N5, and ABSTINENCE—are observed measurement items, or indicators (E1-E6 and N1-N5 are scales). The ovals in the

model—INTENTION and NORMS—are the latent factors, or constructs being represented by their respective scales.

The measurement model step is equivalent to performing a confirmatory factor analysis. In this approach, the numbers of hypothesized underlying constructs (i.e., factors) are specified by the literature (the theory under examination) and researcher *a priori*, and the model is fitted to sample data to assess its convergent and discriminant validity (which together provide evidence for construct validity). Ideally, after an acceptable fit is achieved, the measurement model is then cross-validated using a second set of sample data. In other words, in this step the researcher assesses how well the scales measure the latent constructs which will be included in the structural model.

Once the measurement model has been formulated and tested, a structural model is estimated as the second step. In a structural model, the goal is to examine the underlying relationship, or structure, between the latent constructs tested in the measurement model and other (observed) variables proposed by the theory (see Figure on p. 30, within the wide-dotted box). This structure accounts for the *direct*, *indirect*, and *total effects* among factors (Bollen, 1989). A direct effect is the directional relationship between two variables, and is the type of relationship usually examined through ANOVA and regression. An indirect effect is an independent variable's influence on a dependent variable, through a single or possibly multiple mediating variables (Hoyle & Panter, 1995). The standardized indirect effect is the product of the standardized direct effects. Using the model in the Figure on page 30 as an example, if NORMS has a direct effect on INTENTION ($\beta = 0.35$), and INTENTION has a direct effect on

ABSTINENCE (β = 0.50), then NORMS can be said to have an indirect effect on ABSTINENCE (NORMS→INTENTION*INTENTION→ABSTINENCE = 0.175). To compute the total effect of NORMS on ABSTINENCE, one would take the sum of the NORMS→ABSTINENCE direct effect and the NORMS→INTENTION*INTENTION→ABSTINENCE indirect effect (0.25 + 0.175 = 0.425).

To test the fit of sample data to the structural model, SEM software examines covariances rather than individual cases (as happens in regression techniques). To examine relationships in SEM, matrix algebra is used to account for variances of each variable and covariances of each pair of variables (Stevens, 2002). This covariation makes SEM a more applicable and generalizable technique than regression, allowing for the simultaneous examination of multiple independent and dependent variables. It is important to bear in mind that these variables are known in SEM, respectively, as *exogenous* and *endogenous* variables. The name exogenous variable means that the cause of the variable is determined *outside* of the specified model. Endogenous variables, on the other hand, are determined *within* the model (that is, endogenous variables are hypothesized to be predicted by other variables in the model).

Assessing Model Fit

A strength of SEM is that the analyst obtains both a global assessment of model fit and tests of individual parameters. The researcher begins by evaluating global model fit. Quantifying the correspondence between the predicted covariances and the observed covariances (which is the analytic focus of SEM) generates a *goodness-of-fit value* or

index. In classical statistics, effect sizes characterize the fit of a model to data (e.g., R^2 for a regression model). Similarly, in SEM, fit indexes may be thought of as effect sizes. Consulting these indexes and checking for model fit can lead to important model improvements. For instance, specific paths can be re-drawn to hypothesize new relationships or the entire model can be re-specified to exclude factors with weak explanatory power.

While there are a number of fit indexes available, unfortunately there is not one index appropriate for all analytic conditions. There are, nevertheless, general fit index "rules of thumb" to consider with recommended cutoff values. Hu and Bentler (1998), for example, suggest that researchers always examine and report chi-square (χ^2) for *exact fit*, which tests whether there is a statistically significant difference between the model and the sample data, and degrees of freedom (df) for each model estimated. Since χ^2 can be heavily influenced by sample size, however, the χ^2/df ratio may be reported. According to Bollen (1989), there is little consensus, for the χ^2/df ratio, on what represents a 'good fit,' with recommendations as high as five, and as low as two (or less). In health behavior research studies, ratios between two and five have often been employed.

Hu and Bentler (1998) further recommend assessing and reporting results from several *approximate fit* indexes because one or more are insensitive to sample size and/or impervious to estimation methods (e.g., maximum likelihood or generalized least squares). The Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI), for example, indicate how much better the model fits the sample data than a null model, which

stipulates that there are no common factors. Unlike the CFI, however, the TLI moderately corrects for model parsimony. The Root Mean Square Error of Approximation (RMSEA) is similar to the chi-square test in that it is more or less a "badness of fit" test. Possible values for these fit indexes range between 0 and 1, although TLI can exceed 1. With regards to what a "good fit" actually *means*, there is little consensus. Cutoff values of 0.95 for TLI/CFI (the higher the better) and .06 for RMSEA (the lower the better) have been suggested (Hu & Bentler, 1999). However, Browne and Cudeck (1993) suggested that fair fitting models have RMSEA values in the range of 0.05 to 0.08, even as Marsh, Hau, and Wen (2004) cautioned against broadly applying these "golden rules of fit" without first considering their limitations. In brief, then, values further away from the recommended cutoff points indicate potential inconsistency between the model and sample data, while values near the recommendations suggest that the model might be useful. Once global fit is met, then the researcher examines individual parameter estimates and confidence intervals to learn which paths denote the strongest relationships or explain the greatest amount of model variance.

In sum, the theory the researcher is examining guides the measurement and structural modeling process by specifying 1) the number of underlying constructs in the model and 2) how these constructs are interrelated. Results produced by the software package, such as model fit statistics and parameter estimates, are used to test and improve overall model fit. For good examples of this modeling process, see Blue, Black,

Conrad, and Gretebeck (2003), Park, Wilson, and Lee (2004), and Saunders, Motl, Dowda, Dishman, and Pate (2004).

What Cautions Should SEM Users Exercise?

Although SEM is a sophisticated analytic tool for testing theoretical models with multiple endogenous/exogenous variables, its application alone does not resolve (or even address) the limitations of behavioral and social science research. When considering SEM, researchers must exercise the following four cautions concerning its utilization.

SEM Does Not Compensate for Poorly Conceived Ideas or Weak Theoretical Grounding

Statistics is an important tool in data analysis, but it represents only one of its components. Logical reasoning is another vital data analysis component. But critical as it is, the use of statistical techniques is becoming separated from the sound manipulation of ideas (Aneshensel, 2002), in part due to the rapid development of powerful computer programs. Progress in science, however, is significantly hampered when researchers use, as their guides, implausible theoretical reasoning, frameworks, or models. Although SEM is a more elegant analytic technique than univariate/bivariate methods, as a statistical tool it will never compensate for bad logic and poor ideas/models. As Kenny (1979) stated in his seminal contribution, *Correlation and Causality*, "Causal modeling provides no certain path to knowledge. In fact, models are maximally helpful only when good ideas are tested. Good ideas do not come out of computer packages, but from people's heads" (p. 8). In short, SEM should be used simply as a tool for testing carefully thought-out ideas that are either empirically grounded and/or theoretically generated.

SEM Analyses Are Correlational

SEM is misleadingly called *causal* modeling, but as part of the GLM family, it is still a correlational method. Inferring causation requires more than simply *employing* SEM; instead, a number of conditions must first be met. The most basic condition is that an *association* must exist between the variables postulated to have the cause-and-effect relationship. Second, temporal priority, temporal ordering, or directionality (Bollen, 1989) of the causal relationship must be established (i.e., the cause must *precede* the effect). Rather than being an analytic issue, temporal priority is primarily a methodological matter. That is, to ensure the cause precedes the effect, data must be collected over time. Lastly, a single variable Y must be *isolated* from all influences, with exception of a second variable X. If a change in X accompanies a change in Y, then it can be said that Y *causes* X. In reality (e.g., in health behavior research), however, the isolation of Y from other variables of influence is virtually impossible. Thus, according to Bollen (1989), all models must be looked upon as estimations of reality. So, SEM may give an *indication* of causal relations but, by itself, SEM cannot ensure that association, temporal priority, and isolation have been met (Bullock, Harlow, & Mulaik, 1994). Rather, rigorous methodological planning and implementation in research must accompany use of SEM to increase confidence that causality is being observed (or established).

Model Parsimony Should be a Top Priority

When building a model, parsimony should be a top priority for researchers. A parsimonious model consists of the fewest number of variables, explaining the greatest

possible amount of variance in the outcome(s) of interest. In short, the *simplest* model is the best model. In the second section, however, we noted that health behavior researchers should stay true to the examination of the complexities (i.e., multivariate nature) of human behavior. These complexities force researchers to measure all possible causes and consequences of the health behavior under study. Thus, the resulting model may be one of enormous proportion (i.e., non-parsimonious), with a massive number of variables accounting for these various influences and outcomes. A number of fit statistics, however, penalize the researcher for model complexity, or this lack of parsimony. The challenge for researchers, therefore, is to capture the complexity of human behavior using the fewest number of variables possible. One solution to the model parsimony issue is to include large numbers of observed variables, measured by the smallest possible number of latent factors with the fewest possible number of structural paths. See Sivo and Willson (1998) for a more detailed discussion of model parsimony.

Sample Size Issues

Having an adequate study sample size can be a major concern in SEM utilization. In general, small samples are more likely to result in unreliable and untrustworthy parameter estimates and fit statistics, yielding models which are nonreplicable. West, Finch, and Curran (1995) noted that decreasing sample size leads to an increase in the probability that analyses will fail to converge or result in inappropriate solutions. What, then, constitutes an *adequate* sample size? Several authors (Chou & Bentler, 1995; Fan, Thompson, & Wang, 1999) have suggested that at least 200 cases are necessary for

adequate model specification. Stevens (2002) noted that 15 cases per predictor in standard ordinary least squares regression is a good rule of thumb. Since SEM and regression are similar in many respects, 15 cases per measured variable in SEM is not unreasonable (Research Consulting, ITS, UT, 2001). In reality, however, there is no ideal sample size for all situations. Adequate sample size may depend on the complexity of the model being tested and the statistical estimator used. For instance, more complex models and those with multiple indirect effects may need a greater number of cases. For confirmatory factor analyses, Flora and Curran (2004) provided evidence that one can use weighted least-squares estimators with sample sizes as small as 100 cases. The interested reader should refer to other sources (Fan, Thompson, & Wang, 1999; Hu & Bentler, 1999) for a more detailed discussion of SEM and sample size issues. See also Muthén and Muthén (2002) for a demonstration of how researchers can use a Monte Carlo (or simulation) study to decide on sample size and determine power for SEMs, using M*plus*.

What Resources Are Available to SEM Users?

Aids and resources abound for both the novice and experienced SEM user, including books, journals, e-mail discussion lists, and statistical software packages. For beginners, there are a number of textbooks (Hoyle & Panter, 1995; Raykov & Marcoulides, 2000) and book chapters (Klem, 2000; Thompson, 2000) providing useful overviews. Some texts even present user-friendly introductions to specific SEM software packages, such as Amos (Byrne, 2001), EQS (Byrne, 1994), and LISERL (Byrne, 1998).

For seasoned SEMers, Bollen's (1989) encyclopedic reference may serve as a key resource.

In 1994, *Structural Equation Modeling: A Multidisciplinary Journal* began quarterly publication. This journal has, since, served as the flagship peer-reviewed periodical for researchers utilizing SEM analyses in various disciplines, including health/medicine, psychology, education, economics, sociology, business, and political science. Contents of the journal include theoretical, methodological, and applied pieces, book reviews, software package reviews, and a teacher's corner with instructional modules.

Supplementing the various text and journal resources is an electronic mail network for SEMers called SEMNET. Begun in 1993, and owned by Dr. Carl E. Ferguson Jr., professor of marketing at The University of Alabama, SEMNET serves as an open forum for ideas and questions regarding analysis of covariance structures, path analysis, and confirmatory factor analysis. SEMNET archives can be searched at http://bama.ua.edu/archives/semnet.html, and additional information can be retrieved from the SEMNET information site (http://www2.gsu.edu/~mkteer/semnet.html).

Finally, numerous software packages exist for SEM analyses, including Amos (Analysis of Moment Structures), EQS (Equations), M*plus*, LISREL (Linear Structural Relationships), CALIS (Covariance Analysis and Linear Structural Equations, in SAS), and Mx. These programs, historically known for their complex code commands and large computer memory/space requirements, are now much more user-friendly and accessible. Most programs still allow users to write code containing matrix algebra

commands. However, many packages such as Amos and EQS have graphical interface options, allowing analysts to draw their measurement/structural models on the computer screen and tap into a data set to generate output. Most range in cost from $500-600 for the basic-level package, which may exclude add-on features, user's guides, and technical support. Mx, however, is freely available for download through the WWW, and the package can do the usual SEM analyses and more. For a fee (usually between $900-1200), individuals can enroll in training courses on conducting SEM with various software packages, which are held in major cities and on college campuses. These trainings are regularly offered through professional associations (see the APA Advanced Training Institutes online at http://www.apa.org/sci.e.nce/ati.html), universities (see the University of Kansas Continuing Education website at http://www.continuinged.ku.edu/programs/rda/index.php), and software manufacturers (see the SPSS/Amos website at http://www.spss.com/training/ or the M*plus* training site at http://www.statmodel.com/courses.shtml). The Table on page 27 summarizes the more commonly used SEM applications, including resource and pricing information as well as specific strengths and weaknesses regarding each package.

Conclusion

We have organized this primer to allow readers, both new and experienced users of SEM, to review any one of the 5 free-standing sections most pertinent to their needs or knowledge level. It is our hope that this paper has familiarized health behavior researchers with the purpose of SEM, *why* SEM is valuable as an analytic technique, *how* SEM is conducted, and cautionary notes related to using SEM. We also hope that

we have equipped the interested reader with the necessary resources and information regarding SEM analyses and available software packages. Finally, we hope that this primer will thrust SEM into the daily vocabulary and, most importantly, into the routine practice of health behavior and health promotion researchers. The generation of high-quality research depends upon it. Tables II.1 and II.2 and Figures II.1 and II.2 follow.

Table II.1. Utilization of Structural Equation Modeling and Other Multivariate Analytic Techniques in Published Articles from 3 Health Behavior Research Journals, 1996-2004

Journal Name	# of Articles Using SEM[a]	# of Articles Using Other Multivariate Techniques[b]	Total # of Articles Using Multivariate Techniques	# of Data-Based Articles Published, Including in Supplements and Special Issues
American Journal of Health Behavior	7	24	31	416
American Journal of Health Promotion	5	15	20	325
Health Education and Behavior	7	14	21	275[c]

Note.

[a] Boolean search in MEDLINE/PsycINFO: (structural equation modeling) or (SEM) or (LISREL) or (AMOS) or (EQS) or (mplus) AND (American Journal of Health Behavior) AND (American Journal of Health Promotion) AND (Health Education and Behavior)

[b] Boolean search in MEDLINE/PsycINFO: (MANOVA) or (multivariate analysis of variance) or (cluster analysis) or (factor analysis) or (multidimensional scaling) or (CCA) or (canonical correlation analysis) or (discriminant analysis) AND (American Journal of Health Behavior) AND (American Journal of Health Promotion) AND (Health Education and Behavior)

[c] Issues from 1997 (volume 24, issue 5) to 2004. Prior to this volume/issue, journal was *Health Education Quarterly*, and we do not have access to these issues.

Table II.2. A Comparison of Various SEM Features by Program Package

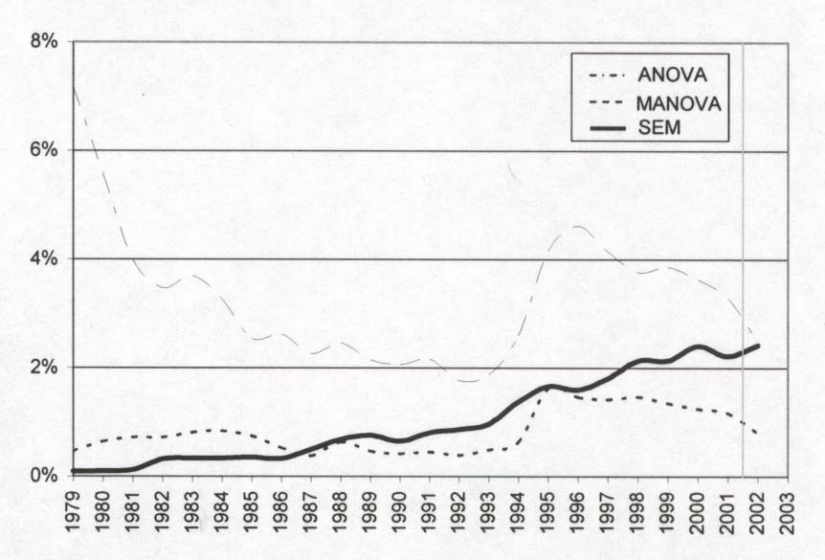
KEY FEATURES	PROGRAM NAME					
	Amos 5 http://www.spss.com/	**EQS 6** http://www.mvsoft.com/	**M*plus* 3** http://www.statmodel.com/	**LISREL 8** http://www.ssicentral.com/	**PROC CALIS** http://www.sas.com/	**Mx** http://www.vcu.edu/mx/
Has the ability to handle missing data via FIML or MI	☑	A	☑	☑	B	☑
Offers accessible/online technical support	☑	☑	☑	☑	☑	☑
Allows for graphical forming of models	☑	☑		☑		☑
Can conduct analyses with categorical outcome variables		☑	☑	☑		☑
Has the ability to fit multilevel or hierarchical SEM models		☑	☑	C	☑	☑
Has the ability to model non-normal continuous data	☑	☑	☑	☑	☑	☑
Has the ability to model non-normal continuous incomplete data		☑	☑			☑
Has the ability to model categorical incomplete data			☑			☑
Computes direct, indirect, and total effects and associated asymmetric confidence intervals	D	E	☑	☑	E	☑
Offers tests for multivariate normality	☑	☑	F	☑	☑	
Pricing [G]	$599 (Academic), $549 (Government), $999 (Commercial)[F]	$595 (Academic), $695 (Government/Corporate)[F]	$595 (Academic), $695 (Commercial/Government/ Non-profit)[F]	$495 (Academic and Commercial)[F]	Proc Calis is included with SAS. Contact local sales office through SAS website.	This program is freely available through the Mx website.

Table II.2 continued

Comments	• Easy to use, quick learning curve • Provides models and model results in a graphical form, using a drawing tool, which may be useful for more "visual" analysts • Reads a wide variety of data file formats, including SPSS and Excel	• Provides models in a graphical form, using a drawing tool • Comes in Windows or Macintosh versions	• Very flexible overall • Excellent online technical support (Linda Muthén, one of the software authors, handles all online queries) • Can only read data from a text (.dat) file.	• Program syntax is sufficiently complex to require an unusually careful attention to detail on the part of the analyst • Detractors refer to its user interface and the level of sophistication. It is more complicated than other programs	• Can manage missing values with PROC MI[B] • Non-graphical format, requires knowledge of syntax	• Does many of the usual SEM analyses (and then some) and is free to try • Offers model fit indexes found in the major commercial programs, such as LISREL, EQS, and Amos • Can only read data from a text (.dat) file

Note.
[A] Implements ML-EM procedure, which is similar to Arbuckle's FIML.[20]
[B] Multiple imputation available through SAS PROC MI (available in version 9.x)
[C] LISREL 8.72 for Windows includes a multilevel SEM module which allows general 2-level structural equation models.
[D] Can compute as long as there are no missing data.
[E] Can compute direct, indirect, and total effects, but not asymmetric CIs.
[F] Available for mixture models only.
[G] Pricing is current as of summer 2005, and is listed for the basic-level package only. Add-ons, user's guides, and technical support may not be included.

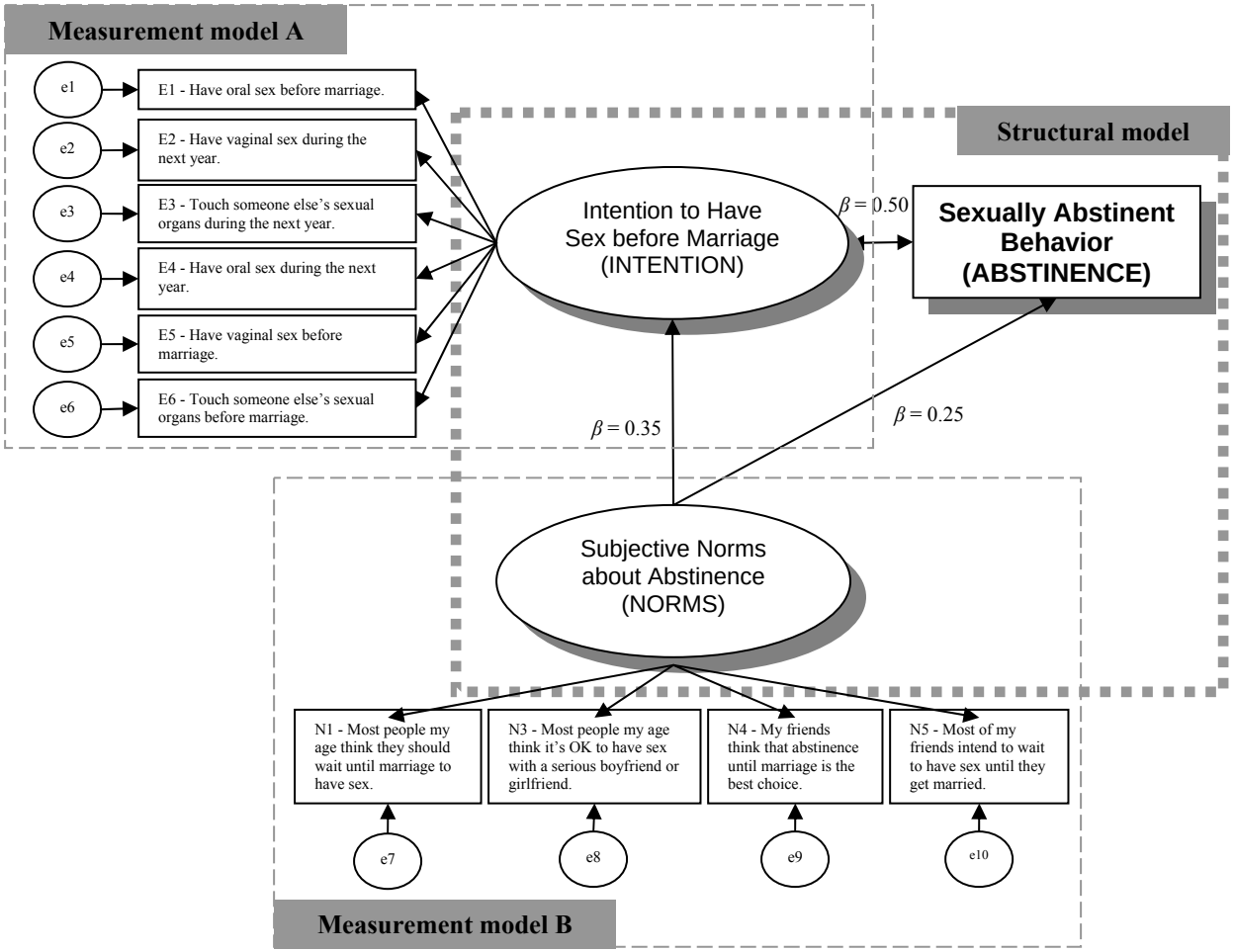
Figure II.1. Citation Frequencies of SEM and (M)ANOVA in the PsycINFO Database Between 1979 and 12/2002



Note.

***The numbers are standardized with respect to the total number of records per year. Figure reproduced with permission from MPR Online**

Figure II.2. Sample Measurement and Structural Model



CHAPTER III

UNDERSTANDING ADOLESCENT SEXUALLY ABSTINENT BEHAVIOR AND INTENTIONS THROUGH STRUCTURAL EQUATION MODELING AND USE OF THE INTEGRATED THEORY

Introduction

Identifying antecedents of adolescents' initiation of sexual intercourse has been a topic of special interest for many scholars over the past two decades. One in five teens in the United States report having had sexual intercourse before the age of 15 (National Campaign to Prevent Teen Pregnancy, 2003), and early initiation can lead to two well-identified and critical public health problems: unintended pregnancy and sexually transmitted infections (STIs) including HIV (Klein & the Committee on Adolescence, 2005). About 34% of American females become pregnant before the age of 20 (National Campaign to Prevent Teen Pregnancy, 2005a). Anywhere between 74 and 95% of teenage pregnancies in the US are unintended (Advocates for Youth, 2004), and teen pregnancy rates (in the US) remain among the highest of the industrialized nations. Compared with younger adults, adolescents are at a higher risk for acquiring STIs such as chlamydia and gonorrhea (CDC, 2003; Kaestle, Halpern, Miller, & Ford, 2005), and almost 4 million of the approximately 12 million new STI cases annually occur among adolescents (USDHHS, 2000).

Rationale

Although there has been substantial research interest in predictors of adolescent sexual behavior, investigations, historically, have suffered from four notable limitations. First, many studies completely lack a theoretical grounding or fail to utilize a theoretical framework to guide the development of hypotheses. Research grounded in behavioral theory has two pivotal implications: 1) a better understanding of health (including sexual) behavior and 2) a basis upon which public health interventions can be developed and evaluated, to improve the health status and quality of life of individuals and communities (Noar & Zimmerman, 2005). According to Reiss (1999), however, "sexual science does not have a good record in building explanatory theory." For example, Ruppel (1994), in his review of two major sexuality journals over a 20-year period, found that 70% of the research reports lacked a systematic presentation of theoretical issues. Goodson, Evans, and Edmundson (1997) corroborated this finding in a review of correlates of early intercourse among female adolescents: 69% of the reviewed studies did not employ a theoretical framework or conceptual model to direct inquiry.

Second, when researchers do employ a theoretical framework to guide their study, there are numerous health behavior or social science theories from which they choose (Moore & Sugland, 1997), and no one comprehensive, multidimensional theoretical model on adolescent sexual behavior or teen pregnancy prevails (Nitz, 1999). For example, Social Cognitive Theory (DiIorio, Dudley, Kelly, Soet, Mbwara, & Sharpe Potter, 2001), the Theory of Planned Behavior (Collazo, 2004; Sieverding, Adler, Witt, & Ellen, 2005; Villarruel, Jemmott, Jemmott, & Ronis, 2004) and Theory of Reasoned

Action (Collazo, 2004; Flores, Tschann, & VanOss Marin, 2002; Gillmore, Archibald, Morrison, Wilsdon, Wells, Hoppe, et al, 2002), Social Control Theory (DeLamater, 1981, 1989; Rostosky, Regnerus, & Comer Wright, 2003), and Problem Behavior Theory (French & Dishion, 2003) have all been applied to empirically examine adolescent sexual behavior. Although these theories collectively address a broad range of salient elements which are posited to influence sexual behaviors, they have largely stood in isolation from one another (Bearinger & Resnick, 2003), i.e., authors typically have not compared the utility of multiple behavioral theories, side-by-side. Additionally, to our knowledge, the more common elements in the above theories have never been tested *together*, as part of a multidimensional theoretical framework, to predict or explain the sexual (or sexually abstinent) behavior of adolescents.

Third, most researchers would acknowledge that adolescent sexual behavior is complex and multifaceted (Moore, Miller, Glei, & Morrison, 1995), however, much of the research into predictors of this behavior has neglected the use of multivariate analytic techniques, employing instead simple *univariate/bivariate* methods (Buhi & Goodson, 2006; Goodson, et al., 1997). These methods include chi-square analyses, t-tests, ANOVA, and regression rather than more appropriate multivariate methods (e.g., canonical correlation analysis, multivariate analysis of variance, and structural equation modeling [SEM]). For instance, according to a systematic literature review of studies examining the relationship between self-esteem and adolescent sexual behavior (Goodson, Buhi, & Dunsmore, 2006), *bivariate* techniques were utilized in 76% of the studies, and only two reports used multivariate analytic techniques (one being SEM).

According to Goodson, et al. (1997), "The development of high-quality research which attempts to address teenage sexual behavior as a complex, multifactorial phenomenon will require more sophisticated tools for data collection, analyses, and interpretation" (p. 155) than what is typically found in adolescent sexual behavior research.

Fourth, although research has provided great insight into the many factors that correlate with early sexual initiation, there has not been much systematic study regarding *sexual abstinence* among adolescents. That is, we do not know much about *why* youth remain sexually abstinent or *why* they postpone intercourse until later ages (Dunsmore, 2005; Rasberry, 2006). These remain important unanswered questions, as the federal government has increased its allocation of millions of dollars each year for abstinence-promotion programs (National Campaign to Prevent Teen Pregnancy, 2005b). Further, there remain hundreds of other initiatives, including comprehensive sexuality education programs, which have as their primary goal promoting sexual abstinence among youth participants. Thus, in-depth study on the predictors of sexual abstinence is sorely needed.

Given the weaknesses we described above, the overarching purpose of this study is to address some of the limitations of the adolescent sexual behavior literature. In this study we employ a powerful multivariate analytic technique, SEM, to test an integrative theoretical framework (The Integrated Theory) for explaining adolescents' sexually abstinent behavior and intentions to remain abstinent before marriage (see Buhi & Goodson [2006], Kirby [1999, 2001], Kotchick, Shaffer, Forehand, & Miller [2001], Miller [2002], and Moore, Miller, Glei, & Morrison [1995] for in-depth reviews of the individual factors included in this framework).

Theoretical Framework

Fishbein (2000) argued that we do not need new theories of behavior and behavior change; rather, we need to integrate and empirically test existing behavioral theories. Bearinger and Resnick (2003) concurred when they wrote,

> What is needed, especially for insight into the complex array of influences on sexual behavior, is an integrative theoretical schema that crosses conceptual boundaries and unifies the strengths of the diversity of health behavior theories and models. (p. 345)

The theoretical framework utilized in the current study was informed by two elements: 1) the National Institute of Mental Health (NIMH)-commissioned theorists' workshop (Fishbein, Triandis, Kanfer, Becker, Middlestadt & Eichler, 2001) and 2) the further conceptualization of the workshop elements by other researchers (Fishbein, 2000). In 1991, five leading behavioral theorists—Albert Bandura, Marshall Becker, Martin Fishbein, Frederick Kanfer, and Harry Triandis (all proponents of behavioral theories that enjoy traditional reputations in the field of health promotion)—were invited to the NIMH-commissioned theorists' workshop. Participants were asked to reach a consensus on a set of variables which appear to serve as the primary determinants of any given health-related behavior or behavior change. They settled upon eight factors which, "appear to account for most of the variance in any given deliberate behavior" (Fishbein, et al., 2001, p. 5):

> For a person to perform a given behavior, one or more of the following must be true: The person has formed a strong positive *intention* (or made a commitment)

> to perform the behavior; There are no *environmental constraints* that make it impossible for the behavior to occur; The person has the *skills* necessary to perform the behavior; The person has a positive *attitude* toward performing the behavior; The person perceives more social (*normative*) pressure to perform the behavior than to not perform the behavior; The person perceives that performance of the behavior is more consistent than inconsistent with his or her self-image, or that its performance does not violate *personal standards* that activate negative self-sanctions; The person's *emotional reaction* to performing the behavior is more positive than negative; and the person perceives that he or she has the capability to perform the behavior under a number of different circumstances; in other words, the person has perceived *self-efficacy* to execute the behavior in question. (Fishbein, et al., 2001, p. 5, italics added)

The five theorists did not achieve consensus, however, regarding *how* these eight elements are inter-related, or conceptually organized. Fishbein (2000) later conceptualized these relationships, and termed this framework "The Integrated Theory."

An assumption underlying The Integrated Theory is that various intra-personal psychological factors (both affective and cognitive) influence youth's intentions (or "motivation") to remain abstinent (or, conversely, to engage in sex before marriage). Changes in these various intra-personal factors (e.g., self-standards, perceived norms, etc.) may lead to the development of intentions that favor abstinence-until-marriage. Youth's intentions, in turn, may be the strongest predictor of sexually abstinent behavior (Montano, Kasprzyk, & Taplin, 1997), although some scholars question this

presupposition (see Baron & Kenny [1986] and Mathur [1998]). The model portrayed in the Figure on page represents the mapping of The Integrated Theory to factors associated with adolescents' sexually abstinent behavior and intentions to remain abstinent.

Methodological Rationale

To test these factors, and the explanatory ability of the theory, a sophisticated multivariate technique—structural equation modeling—is warranted. SEM maintains several advantages over simpler analytic techniques such as regression (Buhi, Goodson, & Neilands, In press). First, SEM was created to test and refine theoretical models attempting to explain or predict social or behavioral phenomena (Bentler, 1988), and thus the method is most appropriate for use in this study. Second, unlike older techniques which assume zero measurement error in sample data (which is never the case), SEM is unique in its ability to isolate measurement error variance during analyses. Third, SEM helps control for inflation of experimentwise (or Type I) error and, lastly, SEM "best honors the [complex] reality to which the researcher is purportedly trying to generalize" (Thompson, 1994, p. 12). In sexual behavior research, most outcomes (i.e., behaviors) have multiple causes (i.e., predictors) and most causes have multiple outcomes, all interacting dynamically. Sex researchers investigate multivariate, not univariate, or isolated, phenomena with only one or two determinants (Buhi, Goodson, & Neilands, In press). It is impossible to assess how multiple variables behave in each other's company when a researcher limits an analysis to a univariate/bivariate

examination. Instead, SEM allows all variables—multiple independent and dependent variables—to be examined *simultaneously*.

Our purpose in this study was to utilize SEM analyses a) to test the "fit" of The Integrated Theory with middle school youth sample data, and 2) to refine the theory to reflect which elements contribute more powerfully to the explanation of adolescents' sexually abstinent behavior and intentions. The specific research questions were:

1 Is The Integrated Theory adequate for explaining middle schoolers' intentions to remain sexually abstinent and their sexually abstinent behavior?

2 If The Integrated Theory is *not* adequate, what is the adequacy of a refined model in explaining middle schoolers' intentions and sexually abstinent behavior?

3 Does a model with adequate fit replicate (or, does it "hold") when tested against a second set of youth sample data? In other words, how robust is this model?

4 Which variables in The Integrated Theory are the best predictors of students' intentions to remain sexually abstinent and, thus, the best candidates for intervention/programming foci?

Method

Participants

Participants in this study were Texas middle school youth, taking part in a broader statewide evaluation study of Title V-funded abstinence-only-until-marriage

education programs (Goodson, Pruitt, Buhi, Wilson, Rasberry, & Gunnels, 2004; Goodson, Pruitt, Buhi, Rasberry, Julian, & Forbis-Stokes, 2005). The larger evaluation involved data collected from youth in two waves. During the 2003-04 school year (Wave 1), participating youth were recruited from four abstinence programs operating in one rural (n = 14) and one urban (n = 169) southeastern county, and numerous rural counties in central (n = 256) and west Texas (n = 12). During the 2004-05 school year (Wave 2), youth were recruited from three abstinence programs operating in a rural southeast coastal community (n = 175), an urban central Texas area (n = 103), and various rural counties in west Texas (n = 170). In each wave, data were collected immediately before (T1) and after (T2) participation in abstinence-only education programming. There was no random selection of participants and no comparison group (i.e., students *not* receiving an intervention) in this sample.

Included in the current study are 451 seventh and eighth grade students responding during Wave 1, and 448 seventh and eighth graders responding during Wave 2. These respondents returned both T1 and T2 surveys in their respective data collection waves. The sample was predominantly female (Wave 1 = 63.1%; Wave 2 = 59.3%) and White (Wave 1 = 67.6%; Wave 2 = 70.9%) or Hispanic/Latino (Wave 1 = 30.6%; Wave 2 = 29.8%), and most respondents lived with both a biological mother and father (Wave 1 = 62.0%; Wave 2 = 63.8%). See Goodson, et al. (2004, 2005) for detailed information regarding sampling procedures and response rates.

Procedure

The procedures for data collection were reviewed and approved by two Institutional Review Boards. Data collection was coordinated mostly by the abstinence educators working in collaboration with the evaluation team on the broader evaluation project. Signed parental consent forms were required for participation at each of the two time points, as were signed youth assent forms. Written surveys were administered by educators and evaluation team members. To ensure a standardized process, written instructions (including scripts to be read to the youth) were provided to each survey administrator. After completion, youth were directed to place their anonymous surveys in envelopes provided, seal the envelopes, and turn them in to the survey administrator. Survey administrators were responsible for collecting all sealed packets and collecting copies of the assent/informed consent forms before mailing the materials directly to the evaluation team. Consent/assent forms were kept separate from sealed envelopes so that identification of students was not possible. Members of the evaluation team coordinated the data entry, cleaning (i.e., matching youths' T1 and T2 surveys, based on a unique identification code, managing missing values, ensuring the appropriate analytic assumptions were met), and analysis processes.

Measures

The theory-based paper-and-pencil questionnaire was developed by the evaluation team, reviewed by experts in sexuality education and measurement and evaluation, and pilot tested in 2002 with a non-random sample of middle school youth (Goodson, Pruitt, Wilson, Suther, Davis, & Dunsmore, 2002). The instrument was based, in part, on the theoretical framework conceptualized by Fishbein, et al. (2001) and

Fishbein (2000). The only variable in the framework not captured on the questionnaire was *skills*, as skillfulness can only be assessed through direct observation. Copies of the instrument are available from the corresponding author.

Sexually abstinent behavior and intentions. Sexual abstinence was assessed with a single item taken from the CDC Youth Risk Behavior Survey: "Have you ever had sexual intercourse?" (Yes=0, No=1) (CDC, 1997). Test-retest reliability was $r = .54$ for Wave 1 ($p < .05$) and $r = .40$ for Wave 2 ($p < .05$) data. Information concerning the validity of Youth Risk Behavior Survey data is reported elsewhere (Brener, Collins, Kann, Warren, & Williams, 1995). Six questions were utilized to assess *intentions to remain abstinent*. Youth were asked to respond to questions (e.g., I will or will not "Have vaginal sex before marriage"), using a five-point response format, from "definitely will not" to "definitely will." Test-retest reliability scores (correlation coefficients) for these six items ranged from .65 to .75 ($p < .05$). A reliability analysis for Wave 1 data on these six items resulted in a Cronbach's α of .93.

Environmental constraints. Three variables were utilized to assess youths' perceptions of environmental constraints: 1) Perception of support (*Support*), 2) Rules/boundaries (*Rules*), and 3) Parental monitoring/supervision (*Monitoring*). *Support* was measured by three items, using a five-point response format, from "strongly agree" to "strongly disagree" (e.g., "My parents give me help and support when I need it"). Test-retest reliability scores ranged from .57 to .66 ($p < .05$). *Rules* was measured by three items, using a trichotomous response format (e.g., Fill in the circle that best describes the rules in your home about…"Dating:" "Strict rules – No rules"). Test-retest

reliability scores for these items ranged from .49 to .62 ($p < .05$). A reliability analysis for Wave 1 data on *support* and *rules* resulted in Cronbach's α of .90 and .71, respectively. *Monitoring* was measured by four items utilizing varying response formats. Sample items include: "About how many days a week are you home for more than an hour without an adult (like a parent or guardian) being present?" (*days home alone*) and "How often do you 'hang out' with friends of the opposite sex without an adult present (like a parent or guardian) around?" (*time alone with opposite sex*).

Beliefs. Beliefs regarding sexual abstinence were assessed using seven items, scaled on a five-point response format, from "strongly agree" to "strongly disagree." Sample items included: "Sexual relationships before marriage create more problems than they're worth," and "Sexual relationships before marriage are a fulfilling part of life." Test-retest reliability scores ranged from .30 to .61 ($p < .05$), with a Wave 1 Cronbach's α of .87.

Norms. Two variables were utilized to assess youths' subjective norms regarding sexual abstinence: 1) N*orms A* (Others' beliefs about abstinence in general), and 2) *Norms B* (Others' beliefs about abstinence for me…). *Norms A* was measured by four items, using a five-point response format, from "strongly agree" to "strongly disagree" (e.g., "Most of my friends intend to wait to have sex until they get married"). *Norms B* was measured with three items, using a dichotomous response format (e.g., "My best friend thinks 'I should/I should not' abstain from sex until marriage"). Test-retest reliability scores (for items on both scales) ranged from .24 to .55 ($p < .05$), with a Wave 1 Cronbach's α of .78 and .81 for *norms A* and *norms B*, respectively.

Self-standards. Self-standards regarding sexual abstinence were assessed using seven items, scaled on a five-point response format, from "strongly agree" to "strongly disagree." Sample items included: "Having sex before marriage goes against my religious or moral beliefs," and "I'm a responsible person if I don't have sex until marriage." Test-retest reliability scores ranged from .24 to .64 ($p < .05$), with a Wave 1 Cronbach's α of .88.

Emotions. Two variables were utilized to assess youths' emotions: 1) *Emotions regarding sexual abstinence*, and 2) *Emotions regarding sex before marriage*. Youth were asked to respond to questions, for both variables, using a five-point response format ("strongly agree" to "strongly disagree"). *Emotions regarding sexual abstinence* was measured with four items (e.g., "Being sexually abstinent makes me feel happy"). *Emotions regarding sex before marriage* was measured using three items (e.g., "Having sex before marriage makes me feel guilty"). Test-retest reliability scores (for items on both scales) ranged from .21 to .49 ($p < .05$), and Cronbach's α for scaled data from Wave 1 (on each of the two scales) was .90.

Self-efficacy and other variables. Self-efficacy, or confidence to remain abstinent, was assessed using two items ("I can remain abstinent until marriage" and "If I am pressured to have, I can resist"), scaled on a four-point response format, from "not confident at all" to "extremely confident." Test-retest reliability scores for the two questions were .47 to .60 ($p < .05$), respectively, with a Wave 1 Cronbach's α of .71. Additional information requested from youth included gender, grade, age, ethnicity, and importance of religion.

Analytic Approach

Missing data. Missing data for variables in Wave 1 and Wave 2 datasets ranged from 0% to 7.76% ("I can remain sexually abstinent until marriage.") and 0% to 9.6% ("Have you ever had sexual intercourse." [at T2]), respectively. To utilize all available data in the current study, we invoked a sophisticated missing data technique—optimal full information maximum likelihood (FIML; Arbuckle, 1996). FIML has been documented to perform optimally over ad hoc methods such as deletion or mean substitution (Peugh & Enders, 2004; Schafer & Graham, 2002).

Modeling. Structural equation models were estimated using M*plus* 3 (Muthén & Muthén, 2005) to test The Integrated Theory presented in the Figure on page 59. M*plus* is an advanced and flexible software package capable of analyzing dichotomous/binary dependent variables (e.g., ever had sex = yes/no) and offers FIML to handle missing values. Our modeling involved a two-step process, described by Anderson and Gerbing (1988) and Buhi, Goodson, and Neilands (In press).

First, we developed and tested a measurement model, using Wave 1 sample data. In this step, using a confirmatory factor analytic approach, we specified the number of factors (i.e., intentions, emotions, etc.) and the survey items intended to measure the construct, and fitted the model to Wave 1 data to assess its convergent and discriminant validity (which together provide evidence for construct validity). We utilized the M*plus* MLR estimator, which computes standard errors using White's (1980) sandwich formula, allows for FIML handling of missing values, and produces maximum likelihood estimates and a chi-square test statistic that are robust to conditions of non-

normality (Muthén & Muthén, 2005). To improve model fit, we deleted survey items with questionable factor loadings. After we obtained acceptable factor loadings and model fit, we next cross-validated the measurement model using a second but similar set of data (from Wave 2).

Factor loadings, variable means, standard deviations, and factor inter-correlations from the measurement models in Waves 1 and 2 are presented in the Tables on pages 62-63. Due to poor factor loadings, items attempting to infer the latent variable *Norms B* were excluded from further modeling analyses. Additionally, the two items we specified to capture *self-efficacy* did not yield adequate factor loadings, and thus we retained a single observed item ("I can remain abstinent until marriage") to represent this variable.

After developing and testing the measurement model, we estimated the structural models as the second step, using Wave 2 sample data. In a structural model, the goal is to examine the underlying relationship, or structure, among variables proposed by the theory. We utilized the M*plus* WLSMV estimator for the structural model because categorical outcomes were introduced into the analysis (e.g., sexually abstinent = no/yes). To determine the fit between the hypothesized theoretical model and the observed data, we examined the following recommended fit indexes: the χ^2/df ratio, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Weighted Root Mean Square Residual (WRMR) (see Buhi, Goodson, & Neilands [In press]). There are various recommendations from experts in the field regarding ideal cut-off points (or ranges) for goodness-of-fit indexes (Browne & Cudeck, 1993; Hu & Bentler, 1999; Yu, 2002). Little consensus exists,

however, for these cutoff values as being "golden rules of fit" (see Marsh, Hau, & Wen, 2004). Nevertheless, we followed the criteria set by Hu and Bentler (1999) and Yu (2002): values of < .06 for RMSEA, ≥ .95 for CFI/TLI, and ≤ .95 for WRMR. X^2/df ratios from 2 to 5 have been used in other sex research studies (see Mah & Binik, 2002). In short, values close to the recommended cutoff points suggest that the model might be useful, whereas those further away indicate potential inconsistency between the model and sample data (Buhi, Goodson, & Neilands, In press).

Results

Research Question 1: Is The Integrated Theory adequate for explaining middle schoolers' intentions to remain sexually abstinent and their sexually abstinent behavior?

Initial model fit testing of The Integrated Theory was satisfactory, with a χ^2/df ratio of 3.24, CFI/TLI values of 0.44/0.93, and RMSEA and WRMR values of 0.07 and 0.97, respectively. The largest parameter estimates were for self-standards→beliefs (standardized regression coefficients [β] = .797), self-standards→self-efficacy (β = .755), self-standards→norms (β = .717), intentions→T1 abstinence (probit regression coefficient [PBR][3] = .676), self-standards→emotions regarding sex before marriage (β = .638), self-efficacy→intentions (β = .568), self-standards→emotions regarding abstinence (β = .463), and T1 abstinence→T2 abstinence (PBR = .417).

The smallest parameter estimates (and also non-statistically significant) were for intentions→emotions regarding abstinence; support→T2 abstinence; rules→T2

[3] The M*plus* estimates for paths connecting predictors to an observed categorical dependent variable (in this case, sexually abstinent behavior) are probit regression coefficients. A coefficient with a positive sign means the probability of the categorical dependent variable (e.g. being sexually abstinent) is increased when the predictor value increases.

abstinence; time alone with the opposite sex→T2 abstinence; gender→emotions regarding abstinence; all five paths with age; all five paths with being black or African American; four paths with being White: beliefs, norms, emotions regarding sex before marriage, and self-efficacy; and Hispanic→emotions regarding abstinence and Hispanic→emotions regarding sex before marriage. These non-statistically significant relationships were deleted for further rounds of model testing.

Research Question 2: If The Integrated Theory is not adequate, what is the adequacy of a refined model in explaining middle schoolers' intentions and sexually abstinent behavior?

Although the initial model fit was satisfactory, we deleted non-statistically significant variable relationships, and consulted M*plus* modification indexes before re-running the modeling analyses. Modification indexes point to variable relationships which could potentially improve model fit. This step-by-step (systematic) process of deleting weak variable relationships, and establishing new potentially useful variable relationships (e.g., Hispanic→self-standards and importance of religion→self-standards) resulted in seven additional rounds of model testing. The eighth and final model yielded a χ^2/df ratio of 3.16, CFI/TLI values of 0.73/0.95, and RMSEA and WRMR values of 0.07 and 0.86, respectively. These values, considered altogether, are indicative of acceptable model fit. That is, we are confident that the model might is useful in explaining adolescents' intention to remain abstinent and their sexually abstinent behavior (see the Figure on p. 60).

Research Question 3: Does a model with adequate fit replicate (or, does it "hold") when tested against a second set of youth sample data? In other words, how robust is this model?

To assess model and parameter reliability (i.e., replicability), we tested the final model using a second but similar set of sample data (from Wave 1). The replication resulted in an almost perfect reproduction of Wave 2 model fit findings, with a χ^2/df ratio of 3.80, CFI/TLI values of 0.56/0.93, and RMSEA and WRMR values of 0.08 and 0.97, respectively. In the replication, only gender→norms, gender→self-efficacy, and days home alone→T2 abstinence were non-statistically significant. The final model and replication results, in graphical form, are presented in the Figures on pages 60 and 61, respectively.

Research Question 4: Which variables in The Integrated Theory are the best predictors of students' intentions to remain sexually abstinent and, thus, the best candidates for intervention/programming foci?

In the final model, *self-efficacy to remain abstinent* was the largest predictor of *intention to remain abstinent* ($\beta = .379$, $p \leq .001$). However, *beliefs regarding sexual abstinence* ($\beta = .300$, $p \leq .001$) and *perceived norms regarding sexual abstinence* ($\beta = .273$, $p \leq .001$) were also predictive of intention.

The use of the squared multiple correlation (R^2)—the percent variance explained by one or more predictor variables on a dependent variable—in SEM is an ongoing area

of research and debate at the present time (Bentler & Raykov, 2000; Hayduk, 2000, February 20). Consequently, we report R^2 here simply as descriptive statistics of interest, and not as primary statistics. According to the final model, the percent variance explained for T1 and T2 abstinence was 43.1% and 49.8%, respectively. The largest percent variance explained was for *beliefs* (89.8%), followed by *intention* (75.4%), *norms* (67.6%), *self-efficacy* (58.7%), and *self-standards* (24.7%).

Discussion

Results from the current analyses indicate that The Integrated Theory may be very useful in explaining adolescents' intention to remain sexually abstinent and their subsequent sexually abstinent behavior. This study contributes to the adolescent sexual health literature in three ways. First, despite the utility of past research into the predictors of intention and sexual behavior, to our knowledge, no research efforts have followed The Integrated Theory as a guide. This multidimensional theory posits that eight elements can predict or explain why individuals engage in any given health-related behavior. Rather than focusing on a narrow range of explanatory factors, this theoretically driven study examined the simultaneous impact of multiple elements, including intrapersonal, interpersonal, and environmental (or perceived environmental factors), on adolescents' intention and their subsequent behavior.

Second, most studies examining adolescent sexual health employ simple univariate or bivariate analytic techniques. For example, in a systematic review of the empirical research related to predictors of adolescent sexual behavior, over a 10-year period, Buhi and Goodson (2006) found that 78% of the reviewed inquiries used t-tests,

ANOVA, or regression analyses, and only seven employed SEM. Our use of SEM strengthens this research because the method is ideal for testing and refining theoretical models (which was our central purpose). It also strengthens our research by isolating measurement error variance during analyses, controlling for inflation of experimentwise error, and honoring the complex reality to which we are attempting to generalize.

Third, unlike most adolescent sexual behavior research, the current analyses utilized longitudinal data and replication to assess the utility of The Integrated Theory. According to the Buhi and Goodson (2006) review noted above, more than half of the included studies (53.6%) employed a cross-sectional study design, whereas the remainder was longitudinal or prospective. Similarly, 59% of the inquiries reviewed by Goodson, Evans, and Edmundson (1997) in another review were cross-sectional, while 35% were longitudinal. Studies based longitudinally are more appropriate for documenting cause-and-effect relationships due to the control of the temporal priority of variables (i.e., the cause must *precede* the effect). In our study, we tested the sexual behavior transition of adolescents from one time point to another. Further, we, in a sense, validated these variable relationships using a second sample of data. This replication serves to ensure against making a decision based on a single, possibly unusual, outcome or result. Instead, we obtained nearly identical results using data from two separate groups of youth respondents.

Nevertheless, this study suffers from three particular limitations. First, our modeling excluded a key element in The Integrated Theory: skills. Although important, skills were not measured in the larger evaluation study because skillfulness must be

measured through direct observation in naturalistic setting. In other words, researchers would need to follow youth on dates and into intimate situations, only then to examine their communication, negotiation, and/or sex refusal skills in practice. Thus, ability of any sort (nor their self-reporting) was included in the current analyses.

Second, the sample selection procedure in the broader evaluation study may have lent itself to bias. For instance, student recruitment was based on convenience, not on probabilistic sampling procedures. The current sample included students participating in five abstinence-only education programs, which *volunteered* to partner with the evaluation team. Further, these programs were operating in select middle schools, and not a representative sample of middle schools in Texas. Therefore, findings from the current research may not be generalizable to all middle school youth in Texas, nor may they be applied to all youth participating in abstinence-only programs in Texas, or nation-wide. According to Huck (2004), these findings may only be generalized to an abstract (hypothetical) population of adolescents who participate in abstinence programs in Texas.

Lastly, although SEM is often referred to as causal modeling, the findings in this study simply denote correlational relationships. Inferring causation requires more than simply employing SEM as a method; instead, an *association* must exist between the variables postulated to have the cause-and-effect relationship and *directionality* of the causal relationship must be established. In the current study, we partially met these two criteria. For instance, all of the variables included in the final model exhibited strong statistical relationships in the hypothesized manner. Second, with the longitudinal nature

of the broader evaluation study, we were able to test the effects of multiple variables, including beliefs, perceived norms, self-standards, self-efficacy, and intention, at one time point on subsequent sexual behavior, while statistically controlling for previous sexual behavior. The final condition for inferring causation is that variables of interest must be *isolated* from all other influences, which would require the highest level of control: an experimental vacuum (Buhi, Goodson, & Neilands, 2006). Unfortunately, this level of control is virtually impossible, and sex behavior research which employs SEM will only provide a clue that a causal relationship may exist.

Based on our results, adolescents' intentions to remain sexually abstinent is a strong predictor of staying abstinent, even at a second time point. This finding is well-supported by many studies of adolescent sexuality (Buhi & Goodson, 2006; Gillmore, Archibald, Morrison, Wilsdon, Wells, Hoppe, et al., 2002; Stanton, Li, Black, Ricardo, Galbraith, Feigelman, et al., 1996). However, to understand this impact, the relationships among the other variables must be examined. First, we found that greater endorsement of abstinence-related standards predicted 1) stronger beliefs regarding staying abstinent until marriage, 2) a stronger perception that others endorse pro-abstinence norms, and 3) greater confidence (self-efficacy) to remain abstinent until marriage. In turn, stronger beliefs regarding staying abstinent until marriage, a stronger perception that others endorse pro-abstinence norms, and greater confidence to remain abstinent predicted adolescents' intentions to remain abstinent. Both emotions factors failed to predict intentions, "washing out" of the analyses in early rounds of model testing.

There appears to be support in the literature for these findings. In this study, for example, when youth perceived sexual abstinence to be the norm among same-aged peers, they more often reported greater intentions to remain abstinent and, in turn, sexually abstinent behavior. Gillmore, Archibald, Morrison, Wilsdon, Wells, Hoppe, et al. (2002), similarly, found youth who had not had sexual intercourse perceived those around them as positively favoring abstinence, or conversely, negatively favoring having sex at that age. Other studies support the strong relationship between perceived peer norms and youth sexual behaviors or abstinence (Alexander & Hickner, 1997; DiClemente, Wingood, Crosby, Sionean, Cobb, Harrington, et al., 2001; Kinsman, Romer, Furstenberg, & Schwarz, 1998; Kirby, 2001; Kotchick, Shaffer, Forehand, & Miller, 2001; Santelli, Kaiser, Hirsch, Radosh, Simkin, & Middlestadt, 2004; Stanton, Li, Black, Ricardo, Galbraith, Feigelman, et al., 1996). However, as noted above, directionality is an important question in this literature. Could it be that sexually abstinent behavior leads teens to immerse themselves in pro-abstinent environments? Or, is it the influence of pro-abstinent environments that support teens' sexually abstinent behavior. More research may be needed examining the actual peer influences on sexual abstinence.

In terms of environmental constraints, only *days home alone* predicted sexually abstinent behavior. This finding mirrors other studies indicating that time home alone is strongly related to teens remaining abstinent or postponing sexual intercourse (Kotchick, Shaffer, Forehand, & Miller, 2001; Miller, 2002). However, for the *replicated model*, this relationship did not hold. For both models, in fact, *days home alone* only moderately

predicted adolescents' intentions to remain abstinent. The other perceived environmental variables—*rules*, *support*, and *time alone with opposite sex*—all had statistically non-significant relationships with abstinent behavior. It is unclear why these factors failed to play a substantial role in predicting behavior in this study, as measurement model testing yielded adequate factor loadings on the *rules* and *support* indicators. Further, the scaled *rules* and *support* scores appeared to be adequately reliable ($\alpha = .71$ and .90, respectively). Nevertheless, research may be warranted on the further testing of these environmental constraints.

Several findings emerged regarding the demographic and individual difference variables. For example, gender was inversely related to standards, norms, and self-efficacy, meaning that males in this study exhibited weaker endorsements of abstinence-related standards, weaker perceptions of others around them endorsing pro-abstinence norms, and less confidence that they would remain abstinent until marriage. This finding is not surprising given that males statistically differed from females, in the Wave 2 sample, in terms of reporting *ever having had sexual intercourse* (Fisher's Exact Test, $p \leq 0.04$). It is possible that, in this sample, the normative expectations regarding remaining sexually abstinent, and the appropriate age and circumstances of first sex, vary by gender (Pleck, Sonenstein, & Ku, 1993). Are different sexual standards held, either explicitly or implicitly, for young males than for young females? Given that much of the research using national surveys has been conducted with young adult females, more research needs to be conducted with adolescents, especially adolescent boys. In fact, Tolman, Striepe, and Harmon (2002) noted that gender is absent from most

adolescent sexual health models. They further called for in-depth exploration on how gender may promote or undermine adolescent sexual health.

In the current study, the relationship between *importance of religion* and sexual abstinence was mediated by having stronger abstinence-related standards. Sexually inactive youth may be internalizing pro-abstinence values, and this may serve as a protective factor. However, findings from our study also indicated that *importance of religion* was *inversely* related to being more confident to remain abstinent. Although religiosity is, in general, associated with later sexual initiation and less frequent intercourse (Whitehead, Wilcox, Rostosky, Randall, & Wright, 2001), perhaps religion serves primarily as a social control mechanism against early sexual activity, through adult monitoring or supervision (Rasberry, 2006). In terms of self-efficacy to remain abstinent, religiosity may not play a substantial role in allowing youth to develop the confidence to reject peer pressure, or communicate about sex and sexuality.

Finally, being Hispanic or Latino in this study's sample predicted weaker endorsements of abstinence-related standards. What *exactly* this finding means needs to be examined further, as being Hispanic did not significantly predict beliefs, self-efficacy, or perception of norms.

Implications for Practice

Given these limitations, this study has notable implications for sexuality education practice and sex research. First, this model lends itself to application in practice, as educational programs and curricula can easily supplement the provision of information by focusing on self-standards, perceived norms, self-efficacy, and beliefs

regarding sexual abstinence to impact sexual health. For instance, by teaching communication, negotiation, and refusal skills, programs may be able to develop middle school youths' confidence in rejecting peer pressure to engage in intercourse (Kirby, 2001). Further, programs may choose to reinforce the perceived norms about refraining from sex. In the larger evaluation study, for example, it was found that adolescents' perception of norms related to abstinence actually improved from pre- to post-test (Goodson, et al., 2005). This finding indicates that perceived norms may be rather easily influenced through educational programming.

Second, while most programmatic efforts aimed at pregnancy and STI prevention focus on girls, educators may wish to shift their attention to male-targeted programming. As noted above, boys in this study exhibited weaker endorsements of abstinence-related standards, weaker perceptions of others around them endorsing pro-abstinence norms, and less confidence that they could remain abstinent until marriage. Programs may be able to reinforce the perceived norms among young males (e.g., the normative expectations about remaining abstinent, the appropriate age and circumstances of first sex, etc.).

Third, results from the current investigation support many other studies indicating that *time home alone* is strongly related to intentions and teens remaining abstinent or postponing sexual intercourse (Miller, 2002). Both abstinence-only and comprehensive sexuality education programs may be able to influence adolescent pregnancy risk by involving youth during after-school hours (Manlove, Franzetta, McKinney, Papillo, & Terry-Humen, 2004) or by developing a parental component

(designed to increase parent-child closeness or improve parental monitoring/supervision) to accompany sexuality education programming for youth. However, to do this, increased funding support mechanisms must be in place and public policy changes may be warranted. For example, perhaps local education policies supporting year-round schooling (eliminating long summer periods with increased time home alone) or revising school-time hours (beginning class later in the morning and ending later in the afternoon) may decrease adolescents' time home alone and their sex behavior risk.

Implications for Research

This study adds to the sex research literature by testing the explanatory ability of The Integrated Theory using a sophisticated multivariate analytic technique. Several implications for future study should be noted. First, this study tested The Integrated Theory using a sample of middle school students. Does the explanatory power of the model and of individual factors (e.g., self-standards, intentions, etc.), however, change with age or when older (high school) students are examined? Perhaps variables such as perceived norms regarding abstinence (i.e., others' beliefs about abstinence in general) are not strong correlates of older adolescents' sexual involvement.

Second, in part due to potential selection bias, youth in the current samples were predominantly White, female, and had high educational aspirations (i.e., they planned to graduate from a four-year college). Further, most respondents lived with both biological parents, and the majority did not spend much time alone at home unsupervised. Research studies are needed to examine the impact of The Integrated Theory, and its individual elements, among adolescents in more diverse communities, among groups where

educational aspirations are lower, and in settings where youth live in single parent households with little supervision.

Third, this study assessed the influence of the perception of peer norms on intentions. Little is known, however, about *actual* peer and social network influences on abstinence and sex behaviors. As noted above, these influences must be examined further.

Fourth, other than in the current study, to our knowledge The Integrated Theory has only been applied to a small number of health behaviors in limited settings (CDC AIDS Community Demonstration Projects Research Group, 1999; Kamb, Fishbein, Douglas, Rhodes, Rogers, Bolan, et al., 1998; Sayeed, Fishbein, Hornik, Cappella, & Ahern, 2005; Yzer, Cappella, Fishbein, Hornik, Sayeed, & Ahern, 2004). More empirical testing is needed to assess its application to other sex, preventive, and health-risk behaviors among youth and adolescents (e.g., condom use, STI/HIV screening). Lastly, given the implications detailed above for sexuality education practice, if school-based programs are developed based on The Integrated Theory, more research and evaluation studies are warranted to explore these programs' effects. Tables III.1 and III.2 and Figures III.1, III.2, and III.3 follow.

Figure III.1. The Mapping of The Integrated Theory to Factors Associated with Sexually Abstinent Behavior and Intentions to Remain Abstinent

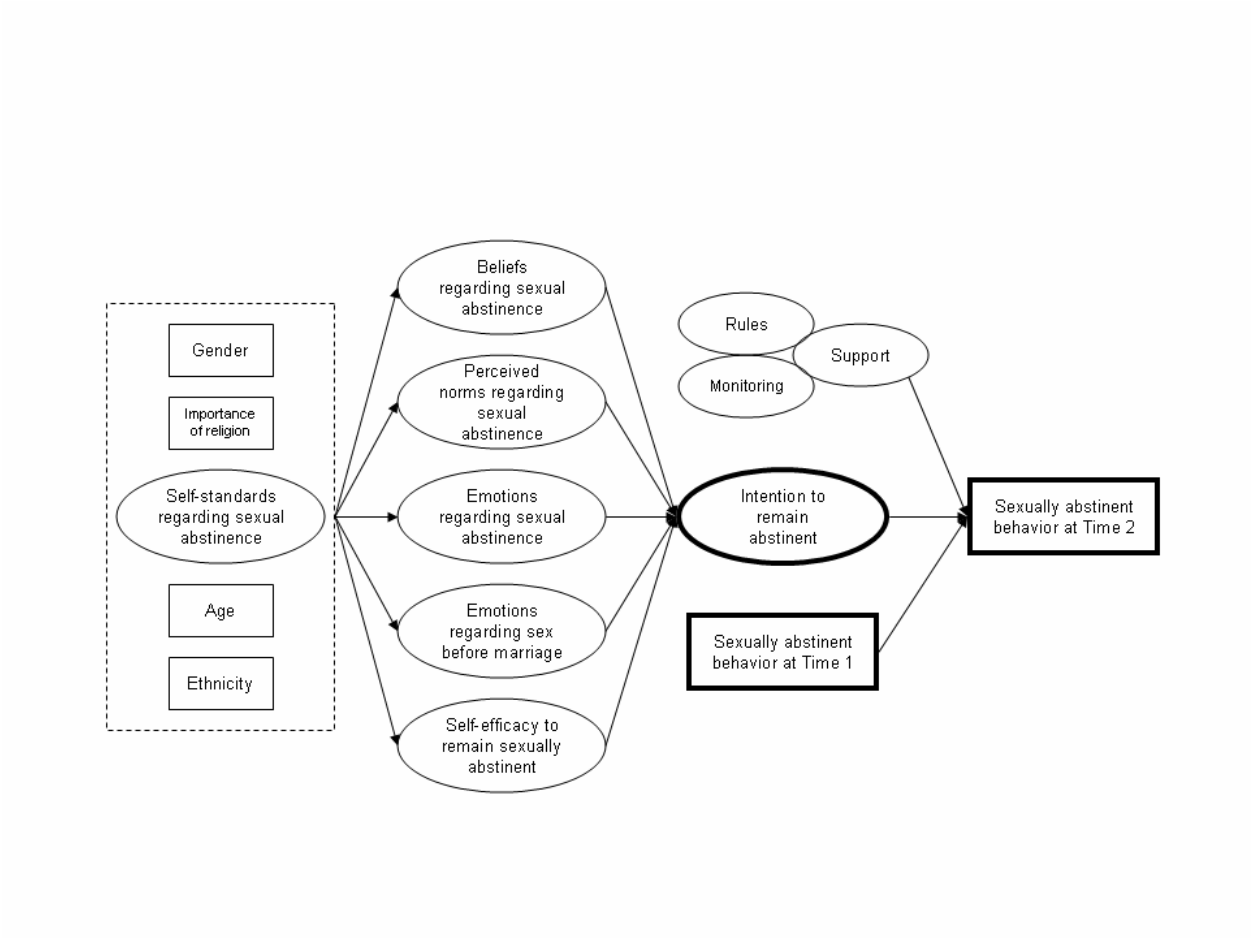
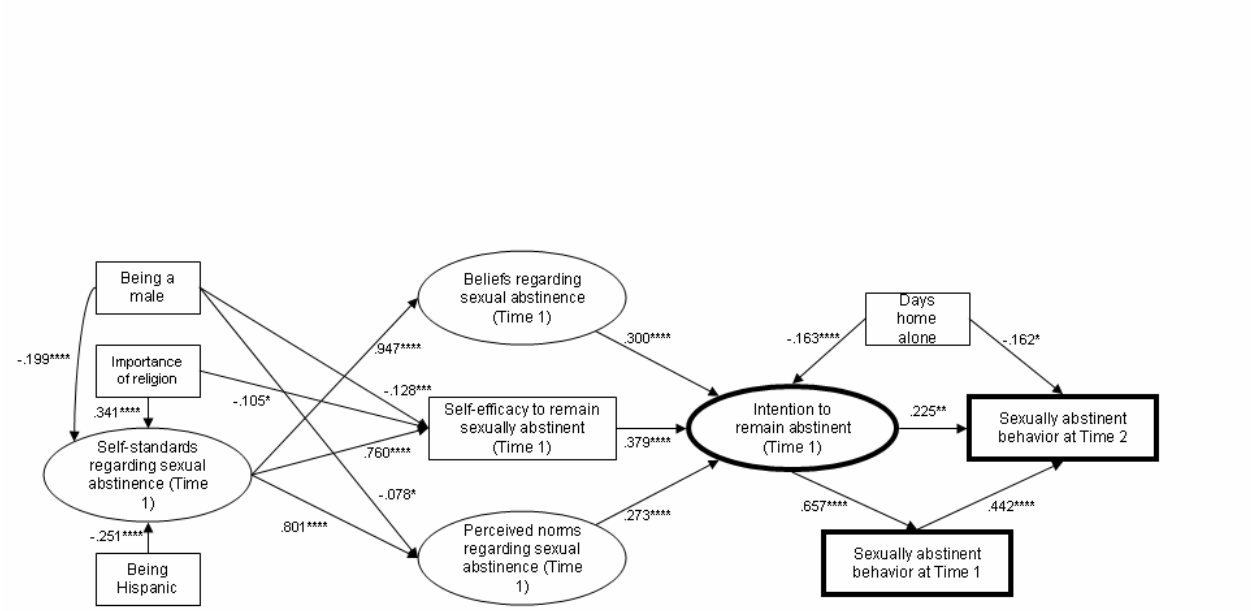


Figure III.2. Testing The Integrated Theory: Final Structural Model of Adolescent Sexually Abstinent Behavior and Intentions to Remain Abstinent, Using Wave 2 Data (n = 439)

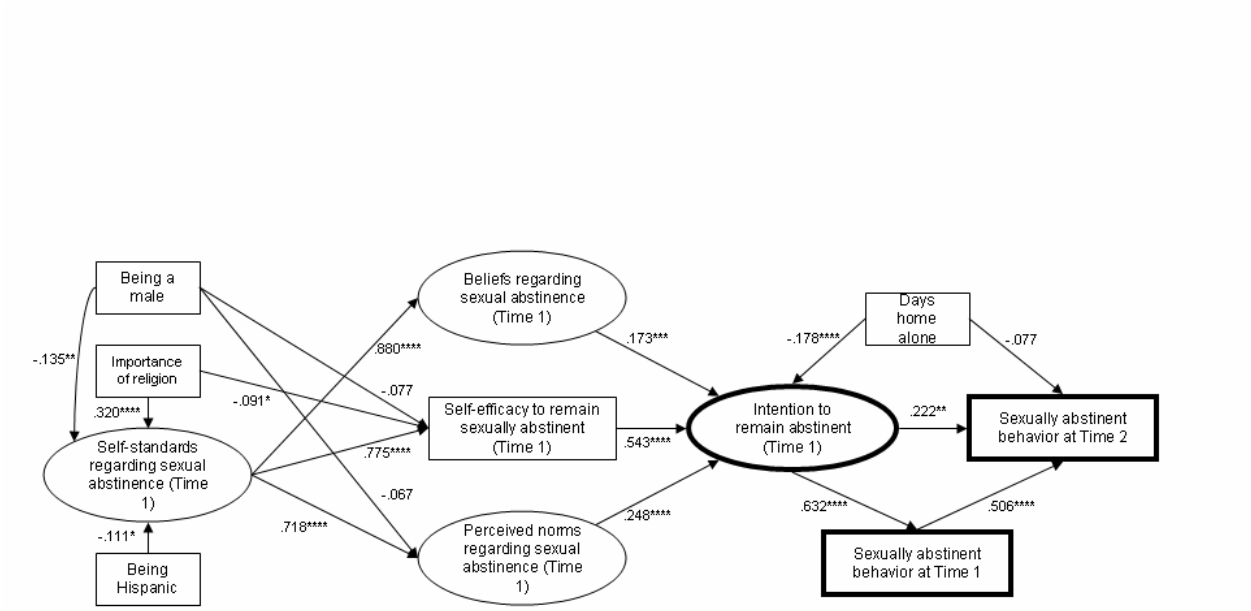


*p ≤ .05
**p ≤ .01
***p ≤ .005
****p ≤ .001

Model Fit
χ^2/df ratio = 3.16
CFI/TLI = 0.73/0.95
RMSEA = 0.07
WRMR = 0.86

Note: Parameter estimates are standardized regression (β) weights, with the exception of those to behavior at Times 1 and 2. These estimates are probit regression coefficients. A probit regression coefficient with a positive sign means the probability of the categorical dependent variable (e.g. being sexually abstinent) is increased when the predictor value increases. A greater magnitude means this probability increases faster.

Figure III.3. Structural Model Replication of Adolescent Sexually Abstinent Behavior and Intentions to Remain Abstinent, Using Wave 1 Data (n = 446)



*p ≤ .05
**p ≤ .01
***p ≤ .005
****p ≤ .001

Note: Parameter estimates are standardized regression (β) weights, with the exception of those to behavior at Times 1 and 2. These estimates are probit regression coefficients. A probit regression coefficient with a positive sign means the probability of the categorical dependent variable (e.g. being sexually abstinent) is increased when the predictor value increases. A greater magnitude means this probability increases faster.

Model Fit
χ^2/df ratio = 3.80
CFI/TLI = 0.56/0.93
RMSEA = 0.08
WRMR = 0.97

Table III.1. Measurement Model Fit and Factor Loadings for Wave 1 (n = 451) and 2 (n = 447) Data

Latent factor - What a higher score indicates	Wave 1 Factor Loading (Mean/SD)	Wave 2 Factor Loading (Mean/SD)
INTENTIONS - Stronger intentions to remain abstinent until marriage		
E1. Have oral sex before marriage.	.85 (4.0/1.21)	.88 (4.1/1.19)
E2. Have vaginal sex during next year.	.81 (4.6/0.81)	.76 (4.6/0.83)
E3. Touch someone else's sexual organs during next year.	.81 (4.3/1.06)	.82 (4.4/1.01)
E4. Have oral sex during next year.	.82 (4.5/0.95)	.79 (4.5/0.89)
E5. Have vaginal sex before marriage.	.86 (4.1/1.17)	.85 (4.2/1.18)
E6. Touch someone else's sexual organs before marriage.	.84 (3.9/1.29)	.86 (4.0/1.32)
BELIEFS - Stronger belief in abstinence until marriage		
L5. Sexual relationships before marriage create more problems than they're worth.	.73 (4.0/1.04)	.73 (4.0/1.19)
L6. It is all right for two people to have sex before marriage if they are in love.*	.73 (3.2/1.27)	.80 (3.5/1.35)
L7. People should have sex only if they are married.	.81 (3.6/1.24)	.81 (3.7/1.29)
L8. Sexual relationships before marriage make life too difficult.	.72 (3.6/1.14)	.65 (3.4/1.30)
L10. A sexual relationship before marriage can be very enjoyable.*	.67 (3.4/1.13)	.77 (3.5/1.19)
L11. Sexual relationships before marriage only bring trouble to people.	.77 (3.5/1.11)	.70 (3.5/1.24)
L12. Sexual relationships before marriage are a fulfilling part of life.*	.64 (3.5/1.06)	.73 (3.6/1.19)
NORMS - Stronger perception that others endorse pro-abstinence norms		
N1. Most people my age think they should wait until marriage to have sex.	.69 (3.4/1.08)	.73 (3.4/1.13)
N4. My friends think that abstinence until marriage is the best choice.	.61 (3.4/1.10)	.78 (3.5/1.16)
N5. Most of my friends intend to wait to have sex until they get married.	.95 (3.6/1.14)	.82 (3.6/1.22)
SELF-STANDARDS - Greater endorsement of abstinence-related standards		
P1. A relationship at this time in my life that includes sex would probably interfere with my future goals and plans.	.69 (4.2/1.07)	.70 (4.2/1.12)
P2. I'm the kind of person who abstains from sex until marriage.	.85 (3.9/1.17)	.87 (3.9/1.19)
P6. I'm a responsible person if I don't have sex until marriage.	.70 (3.9/1.12)	.74 (4.0/1.11)
P7. If I have sex before marriage I'm not being very careful with my life.	.73 (3.8/1.15)	.78 (3.9/1.19)

Table III.1 continued

EMOTIONS A - More positive emotions regarding abstinence		
R1. Being sexually abstinent makes me feel happy.	.97 (3.7/1.15)	.98 (3.7/1.23)
R2. Being sexually abstinent makes me feel good.	.96 (3.7/1.17)	.96 (3.7/1.23)
R4. Being sexually abstinent makes me feel like I'm doing the right thing.	.80 (3.7/1.24)	.89 (3.8/1.27)
EMOTIONS B - More negative emotions regarding sex before marriage		
R6. Having sex before marriage makes me feel afraid.	.83 (3.0/1.21)	.91 (3.5/1.23)
R7. Having sex before marriage makes me feel worried.	.96 (3.0/1.21)	.97 (3.5/1.22)
R8. Having sex before marriage makes me feel guilty.	.75 (3.0/1.28)	.85 (3.6/1.26)
SUPPORT - More support		
I1. I get along well with my parents.	.89 (4.1/0.91)	.66 (4.1/0.93)
I2. My parents give me help and support when I need it.	.68 (4.5/0.79)	.86 (4.5/0.83)
RULES – More rules in the home		
G4. About dating.	.72 (2.0/0.71)	.67 (1.8/0.69)
G5. Going to parties.	.66 (1.9/0.65)	.77 (1.8/0.65)
Fit indexes **χ^2 / df**	2.82	2.60
CFI/TLI	0.90/0.89	0.92/0.91
RMSEA	0.06	0.06
SRMR	0.05	0.04

Note. χ^2 / df = ratio between χ^2 and degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual; Items marked with * were reverse coded.

Table III.2. Estimated Correlation Matrix for Latent Factors – Wave 1 (below the diagonal) and Wave 2 (above the diagonal)

	F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**
F1. Intentions	—	.80	.76	.84	.44	.54	.44	-.48
F2. Beliefs	.71	—	.77	.93	.50	.66	.47	-.51
F3. Norms	.63	.61	—	.80	.48	.60	.42	-.50
F4. Standards	.83	.91	.72	—	.54	.70	.51	-.48
F5. Emotions A	.32	.36	.30	.48	—	.47	.34	-.26
F6. Emotions B	.19	.20	.16	.33	.13	—	.34	-.26
F7. Rules	.32	.27	.40	.39	.24	.01	—	-.25
F8. Support	-.51	-.45	-.39	-.52	-.26	-.14	-.25	—

CHAPTER IV

PREDICTORS OF ADOLESCENT SEXUAL BEHAVIOR AND INTENTION: A THEORY-GUIDED SYSTEMATIC REVIEW OF THE LITERATURE

Introduction

There has been substantial interest among researchers, educators, and policy makers over the past two decades in understanding *why* adolescents initiate sexual intercourse. In the United States, 20 percent of teens report having had sexual intercourse before the age of 15 (National Campaign to Prevent Teen Pregnancy, 2003), and early sexual initiation can lead to two critical public health problems: unintended pregnancy and sexually transmitted infections (STIs) including HIV (Klein & the Committee on Adolescence, 2005). About 34% of American females become pregnant before the age of 20 (National Campaign to Prevent Teen Pregnancy, 2005). Anywhere between 74 and 95% of teenage pregnancies in the US are unintended (Advocates for Youth, 2004), and teen pregnancy rates (in the US) remain among the highest of the industrialized nations. Additionally, many of the new HIV infections are estimated to occur among adolescents and young adults. Compared with younger adults (in and immediately following the college years), teens are at a higher risk for acquiring STIs (CDC, 2003; Kaestle, Halpern, Miller, & Ford, 2005), and almost one-third of the approximately 12 million new STI cases annually occur among adolescents (USDHHS, 2000).

Understanding the factors which explain why adolescents initiate sexual activity at early ages (e.g., having the perception that "everybody's doing it") allows sexuality educators to develop interventions attending to these factors (e.g., programs which back the norm that most adolescents are, in fact, not sexually active). Better understanding also allows educators to effectively target adolescents exhibiting these factors (Kirby, 2002). To date, few systematic reviews have been conducted regarding the predictors of adolescent sexual behavior. Even fewer have examined the methodological quality of this literature. Therefore, much uncertainty remains, in terms of the validity and reliability of the findings that have been uncovered so far. The purpose of the current review was to systematically summarize the scientific, health promotion research literature, over the past decade (January, 1996 – December, 2005), regarding the predictors of adolescent sexual behavior and intentions. Specifically, we utilized a multidimensional theoretical framework—The Integrated Theory (Fishbein, 2000; Fishbein, Triandis, Kanfer, Becker, Middlestadt & Eichler, 2001)—to guide our search and the systematic organization and classification/categorization of published empirical studies examining adolescent sexual behavior outcomes. Additionally, in advance of most other systematic reviews, we assessed this literature's methodological quality, including but not limited to investigators' use of theory to guide inquiry, and utilization of multivariate analytic methods.

Theoretical Framework

The theoretical framework which guided the current review was largely informed by the National Institute of Mental Health (NIMH)-commissioned theorists' workshop

(Fishbein, Triandis, Kanfer, Becker, Middlestadt & Eichler, 2001). Albert Bandura, Marshall Becker, Martin Fishbein, Frederick Kanfer, and Harry Triandis—all proponents of behavioral theories which enjoy traditional reputations in the field of health promotion—were invited by the NIMH in 1991 to reach a consensus on a set of variables which appear to serve as the primary determinants of any given health-related behavior or behavior change. They settled upon eight factors which, "appear to account for most of the variance in any given deliberate behavior" (Fishbein, Triandis, Kanfer, Becker, Middlestadt & Eichler, 2001, p. 5):

> For a person to perform a given behavior, one or more of the following must be true: The person has formed a strong positive *intention* (or made a commitment) to perform the behavior; There are no *environmental constraints* that make it impossible for the behavior to occur; The person has the *skills* necessary to perform the behavior; The person has a positive *attitude* toward performing the behavior; The person perceives more social (*normative*) pressure to perform the behavior than not to perform the behavior; The person perceives that performance of the behavior is more consistent than inconsistent with his or her self-image, or that its performance does not violate *personal standards* that activate negative self-sanctions; The person's *emotional reaction* to performing the behavior is more positive than negative; and the person perceives that he or she has the capability to perform the behavior under a number of different circumstances; in other words, the person has perceived *self-efficacy* to execute

> the behavior in question. (Fishbein, Triandis, Kanfer, Becker, Middlestadt & Eichler, 2001, p. 5, italics added)

Fishbein (2000) later conceptualized how these elements were inter-related, or theoretically organized, and termed the framework "The Integrated Theory." The purpose of this review was to systematically summarize the health promotion research literature, published between 1996 and 2005, with regards to the predictive or explanatory ability of the eight Integrated Theory elements described above. Given the diversity of variables being examined in the adolescent sexual health research, we utilized The Integrated Theory's eight elements as factor "categories"; under each of the eight categories we identified and classified specific variables (pertinent to adolescent sexual health research), thus using the theoretical framework not solely as a conceptual model, but also as an organizing tool. For example, this review searched for findings for specific variables such as *parental monitoring* and *rules;* both variables are categorized under the broader element of *environmental constraints*. The specific variables examined in this review are described in further detail in the modeling analysis by Buhi, Goodson, and Neilands (2006).

We were primarily interested in identifying what statistical relationships exist between each of the eight Integrated Theory elements and adolescent *sexual behavior*, as well as what relationships exist between each of the seven elements and *intention*. We defined sexual behavior in terms of risk behaviors for teens, such as early sexual initiation, reporting ever having had sex, number of sexual partners, and frequency of

sexual intercourse. We defined intention as motivation to engage in the aforementioned sexual behaviors, before marriage and within a future time period (e.g., in the next year).

Methods

Retrieval

Following the procedures outlined in the Matrix Method for conducting systematic literature reviews (Garrard, 2004), we searched four electronic databases (ERIC, MEDLINE, PsycINFO, Sociological Abstracts) using variations and Boolean connections of sexual behavior terms (e.g., sexual initiation or early initiation or sexual intercourse or sexual abstinence) and variations of the eight key elements outlined in The Integrated Theory, including:

- intention;
- skills;
- environment or environmental constraints or family or parental monitoring or rules or support;
- norms or subjective norms or perceived norms;
- self-efficacy or confidence;
- personal standards or self-standards or standards;
- emotions; and
- beliefs or attitudes.

We also searched the reference lists of reviewed studies for additional publications. Sixty-nine (N = 69) publications met these criteria and represented the final sample.

Inclusion and Exclusion Criteria

For inclusion in the review, studies had to: a) be published in a peer-reviewed, English language journal; b) empirically examine the relationship between a predictor/element identified in The Integrated Theory and adolescents' sexual behaviors (i.e., early intercourse initiation/onset, ever having had sex, etc.); c) be published between January 1996 and December 2005; and d) focus on primary and/or secondary school-aged adolescents (youth between 11 and 18 years of age) in the US. Studies were excluded if they summarized research assessing pre- and post-program changes in various predictors. Also excluded were empirical studies involving college students, and theoretical or editorial/personal perspective pieces.

Data Abstraction/Synthesis

In a manner similar to Kirby (2002), we extracted and organized each study's statistically significant findings, as well as non-statistically significant findings, related to the attempted prediction/explanation of adolescents' sexual behavior by the various Integrated Theory elements. A single reviewed study could, thus, contribute multiple findings to the review. Furthermore, when both unadjusted and statistically controlled analyses were reported in the same study, we counted only findings from the controlled tests. We also assessed the methodological quality of the 69 publications by examining key methodological traits employed in a similar (but un-related) review by Goodson, Buhi, and Dunsmore (2006). For instance, the authors examined the study's use of theory (i.e., whether or not a theoretical framework was used to guide the inquiry); use of a sound study design (i.e., longitudinal versus cross-sectional) and recruitment of a high-quality sample (i.e., random sampling, nationally representative, large sample size,

etc.); reporting of psychometric data analyses pertaining to reliability and validity; use of sophisticated data analytic techniques (i.e., multivariate versus univariate); and reporting of effect size measures and confidence intervals for results.

Findings

Studies' Characteristics

The list of reviewed studies can be found in this paper in two locations: 1) in the reference section, marked with an asterisk, and 2) in the Table on page 85 matrix which summarizes reviewed reports.

The 69 studies included here were published in 38 different journals, representing a variety of disciplines. Nearly half the reports (n = 33) were found in health (i.e., health education, health promotion, or public health), medical, or nursing research journals. Twenty-five reports were published in psychology or social science-focused journals. More than half of the studies (n = 39) were found in child or adolescent-specific journals (such as the *Journal of Adolescent Health* and *Youth and Society*). The journal in which studies were published most frequently was the *Journal of Adolescent Health* (n = 14). Only two reviewed articles were published in sexuality-focused journals (*The Journal of Sex Research* and *Sexually Transmitted Diseases*).

Of the 69 studies reviewed, 43 reports (62.3%) explicitly noted the utilization of a theoretical framework to guide investigations. The most frequently employed behavioral theories found in the current review were Social Learning/Social Cognitive Theory (6, 7, 8, 12, 18, 37, 38, 43, 50, 51, 60), Problem Behavior Theory (13, 19, 25, 30, 32, 40, 49), Ecological Systems Theory (32, 33, 39, 45, 52, 61), Social Control Theory

(6, 7, 48, 49, 56), Theory of Reasoned Action (12, 15, 24, 65), Theory of Planned Behavior (12, 15, 59, 67), and Protection Motivation Theory (63, 65). In 14 reports, authors noted using multiple guiding theories in carrying out their research (i.e., combining select elements from two or more different behavioral theories; 6, 7, 8, 12, 14, 15, 32, 37, 49, 50, 51, 56, 60, 65).

Methodological Quality

Study design and sample. Most inquiries (76.8%; n = 53) utilized large samples (> 300 respondents). More than half of the studies reviewed (53.6%; n = 37) employed a cross-sectional study design, whereas the remainder were longitudinal or prospective. Most studies involved participants who were recruited out of convenience, while only 22 studies (31.9%) utilized some sort of random sampling procedure (e.g., stratified random sampling). Fifty-seven reports (82.6%) were based on locally collected or state-level data, and the remainder were based on large-scale, nationally representative samples (e.g., the National Longitudinal Study of Adolescent Health [Add Health; 14, 16, 21, 35, 49, 52, 56], National Survey of Children [4, 36], and National Longitudinal Survey of Youth [32, 41]).

Psychometric analyses. To assess the extent to which studies reported the psychometric characteristics of their data, we classified articles based on an adaptation of the template created by Vacha-Haase and Ness (1999). The adapted categories include the following: evidence for establishing validity/reliability coefficients -- a) reported for data analyzed; b) reported or cited for data from a previous study; c) reported for only some of the data collected (that is, for data obtained from one scale or measure but not

others); or d) not reported at all. Of the 69 studies reviewed, only one-quarter (24.6%, n = 17) provided evidence of validity of the data collected. Five of the articles (7.3%) cited or reported evidence for validity from a previous study. Five studies (7.3%) provided evidence for establishing validity for only *some* of the data they collected. Three out of every five (60.9%, n = 42) reports made no attempts to describe the validity of their data.

With regards to the reporting of score reliability, 63.8% (n = 44) provided reliability coefficients for the actual data analyzed. Three of the articles (4.4%) cited or reported reliability coefficients for data from a previous study. Five articles (7.3%) reported reliability coefficients for only *some* of the data collected. Finally, one-quarter (24.6%, n = 17) of the reports made no effort to report the reliability of their data.

Analytic methods. In terms of the analytic techniques employed, most authors conducted multiple or logistic regression analyses (n = 51), including event history and survival analyses. The next most frequently employed analytic technique (n = 7) was structural equation modeling (SEM; 8, 26, 32, 33, 37, 46, 49), followed by analysis of variance (ANOVA; n = 3). In most studies from the current review (82.6%, n = 57), authors reported some type of effect size measure, such as eta^2 or adjusted R^2. Only in 15 articles (21.7%), however, did authors include the reporting of confidence intervals for findings.

Studies' Findings

The Tables on pages 85-99 list the findings related to the eight Integrated Theory elements and various adolescent sexual behavior outcomes, including but not limited to

ever having had sex, early intercourse initiation, and number of sex partners. Below we summarize these relationships by element.

Intention. Intention, or motivation, to have sex was the most consistent predictor of The Integrated Theory elements. That is, of the eight studies which examined intention, all found an association. Intention to have sex was found to be associated with sexual intercourse or intercourse initiation (26, 28, 42, 59, 67), participation in sexual behaviors (37, 63), and a greater overall heterosocial risk, i.e., being involved in a greater number of sexual possibility situations such as kissing a peer of the opposite sex and progressively riskier situations (1). No studies identified intention as being *unrelated* to adolescents' sexual activity involvement.

Skills. We found no studies examining the relationship between actual negotiation, communication, or refusal skills and sexual intercourse initiation, despite the emphasis placed on developing these skills in the adolescent health literature (Kirby, 2001).

Environmental constraints. The environmental constraints element was the most complex predictor from The Integrated Theory, as we found varying empirical findings pertaining to parental involvement/closeness, quality of the relationship with parents, rules/boundaries, parental support, and parental monitoring/supervision. For example, two reports revealed no effect of perceived parental involvement or closeness (19, 52), while three studies found mixed effects. Ramirez-Valles, Zimmerman, and Juarez (48) found that more time spent with the mother is correlated with delaying first intercourse for girls but not for boys. Ream and Savin-Williams (49) noted that parental closeness

for all dyad types, except for the father-son dyad, and shared activities with the mother only are strong protective factors. Finally, Somers and Paulson (62) reported greater parent-child communication to be associated with *increased* sexual activity, whereas closeness, attachment, and warmth were unrelated to sexual activity.

Regarding parental relationship quality, one study found protective effects (i.e., higher quality mother-child relationship associated with delayed sexual intercourse; 21), two found mixed effects (i.e., higher quality mother-child relationship associated with delayed sexual intercourse initiation for girls but not for boys; 16, 54), and two studies found no effects on intercourse occurrence (14) or on delayed initiation of sexual intercourse (25).

Only a single reviewed study found that fewer parental rules were associated with an increased risk of becoming sexually active (52). Two studies reported no relationship between perceived mother strictness/parental control and initiation of sexual intercourse (19) and intercourse frequency in the last year, the number of sex partners in last year, or the number of lifetime sex partners (6).

Regarding parental support, one study found a protective effect (i.e., as support for *not* having sex increased, the likelihood of abstaining from sex increased; 51), and five reports noted mixed effects (e.g., increased support associated with intercourse delay for White but not for African American females, increased maternal support associated with lower intercourse frequency and fewer partners but not lower age at first intercourse; 7, 13, 36, 38, 39). Seven studies found no protective effect of increased parental support on the various sexual behavior/intention outcomes (6, 29, 41, 45, 60, 66,

69). Finally, two reports revealed increased family/parental support as a *risk factor* for early sexual onset (10) and greater sexual initiation intention (40).

Parental monitoring or supervision was perhaps the environmental constraint with the most inconsistent findings in this body of literature. Thirteen analyses empirically identified protective effects of monitoring/supervision on various adolescent sexual behavior outcomes. For instance, decreased monitoring/supervision was found to be associated with earlier initiation of sex (31, 38, 53, 55), greater sex frequency (8, 38), greater number of sex partners (17, 38, 39), higher sexual behavior risk (27, 30, 65), and earlier sexual activity for boys but not for girls (61). At the same time, 13 analyses in 10 studies found no empirical relationship between monitoring and these behavioral/intention outcomes (1, 3, 4, 6, 10, 11, 25, 39, 45, 69). Other researchers failed to uncover a direct effect of monitoring on sexual behavior outcomes; instead, some investigators found indirect effects of monitoring on intercourse initiation through intention (54, 59), drug use (33), or other mediating variables (32).

The most consistent findings in the environmental constraints category pertained to friends' support and the amount of time adolescents reported being home alone. All four reports that examined increased peer/friend support, found it to be unrelated with any of the sexual behavior outcomes (i.e., delayed sexual initiation and intercourse frequency; 2, 6, 7, 13). The two studies examining time alone reported an inverse relationship between increased time alone with the opposite sex (or being home alone) and sexual activity (45) or earlier initiation of sexual intercourse (19).

Perceived norms. Our findings related to perceived norms as a predictor of adolescent sexual behavior outcomes can be better understood in three categories: Youth's perception of peer sex behaviors, perception of peer attitudes toward sex or their approval of sex, and perception of parental attitudes regarding sex. Regarding peer sex behaviors, 10 reviewed studies revealed that believing *most peers have had sex* (at the individual and aggregated school level) is associated with intentions to have sex (15, 24, 26, 28, 59), early sexual onset (34, 36), and subsequent sexual behaviors or intercourse (42, 63, 64). One study identified mixed findings: perceptions of sexual behavior as normative were associated with engaging in sex for boys but not for girls (51). Five reports found no statistically significant relationship between the perception of peer sex behaviors and sexual behavior outcomes (2, 39, 53, 57, 67).

Regarding perceived peer attitudes toward, or approval of, sex, 11 reviewed studies found a relationship with various sexual behaviors. For instance, adolescents who report a greater perceived peer disapproval of engagement in sex (or a perception that friends hold less favorable attitudes/views toward adolescents having sex) have weak intentions to have sex and are more likely to be sexually abstinent (37, 68) and delay sexual initiation to later ages (12, 18, 43, 58). These adolescents are also less likely to have intercourse experience (44). Further, peers' pro-childbearing attitudes, or attitudes toward being a teen parent, are associated with age at first intercourse, frequency of sexual intercourse, and number of sex partners in the last year (4, 50). One report revealed an indirect effect of perceived attitudes on intercourse, through the mediating variable of *other intimate behaviors* (i.e., noncoital behaviors associated with

progression to coitus, such as kissing and petting; 46). Only three studies found no statistically significant relationship between the perception of peer attitudes and sexual behavior outcomes (5, 19, 40).

Regarding perceptions of parental attitudes toward sex, all three studies examining this factor yielded a consistent finding: Perceived maternal or parental disapproval of engaging in sexual intercourse is related to better adolescent sexual behavior outcomes (i.e., reporting a lower occurrence of sexual intercourse [21], being sexually abstinent [68], and a lower heterosocial risk, i.e., being involved in a lesser number of sexual possibility situations such as kissing a peer of the opposite sex and progressively riskier situations [1].

Self-Efficacy. Eleven reports examined the empirical relationship between self-efficacy and sexual behavior. Seven examinations found protective effects of self-efficacy in the form of negotiating safer sex (60), resisting peer pressure to have sex (18), delaying initiation of sexual intercourse (58), intending to remain abstinent (15), and not engaging in sexual activity or risky sexual behavior (23, 50, 51). However, five examinations revealed no effects of self-efficacy or perceived behavioral control on various sexual behavior/intention outcomes (i.e., sexual intercourse intentions, engaging in risky sexual behavior, ever having had sex, or refusing unwanted sex; 2, 12, 19, 60, 67).

Self-Standards. Two reviewed studies examined pro-abstinence self-standards. DiIorio, Dudley, Soet, and McCarty (19) found personal abstinence values to be related with delayed initiation of sexual intercourse, and Blinn-Pike, Berger, Hewett, and

Oleson (9) revealed that adolescents who held conservative values regarding sex before marriage were more likely to report being sexually abstinent.

Emotions. Only four reviewed studies investigated the empirical relationship between adolescents' emotions and sexual behavior/intention outcomes. We found negative emotions regarding sex (or, conversely, positive emotions toward sexual abstinence) to be associated with intention to remain abstinent (15) and subsequent sexual abstinence (63). Unger, Molina, and Teran (65) revealed that girls who expected more positive consequences from teenage childbearing were more likely to engage in sexual risk behaviors placing them at increased risk for pregnancy. Emotionality and confusion, such as having fears surrounding pain with sexual intercourse and embarrassment over sex, were found to be unrelated to sexual abstinence (9).

Beliefs/Attitudes. A total of 23 reviewed studies examined the empirical relationship between adolescent attitudes about sex, or beliefs about abstinence, and sexual behavior/intention outcomes. Twelve reports found that positive attitudes toward sex (or sexually permissive attitudes) were associated with: Intention to have sex (59), early sexual initiation (28, 35, 43, 53) and intercourse during the last year (69). Conversely, more positive attitudes toward abstinence (or beliefs about postponing sex) were associated with a lower likelihood of initiating sexual intercourse (18, 20, 56) or a delayed onset of sexual intercourse (12, 44, 68). Five studies found mixed results, e.g., sex attitudes, for males but not for females, were found to be associated with reduced likelihood of intercourse, and beliefs about consequences of sex were found to be associated with engaging in sex for boys, but not for girls (14, 28, 46, 51, 67). Five

reports noted no statistically significant relationship between attitudes and sexual behavior outcomes (5, 15, 19, 24, 47).

Discussion

This systematic review contributes to the adolescent sexual health literature in two ways. First, despite the utility of systematic reviews (Goodson, Evans, & Edmundson, 1997) and the availability of several publications regarding the impact of multiple predictors on sexual behavior/intention outcomes (Kirby, 1999; Kirby, Lepore, & Ryan, 2005; Kotchick, Shaffer, Forehand, & Miller, 2001; Moore, Miller, Glei, & Morrison, 1995), to date none have followed The Integrated Theory as a guide. This multidimensional theory posits that eight elements can predict or explain most of the variance in any given health-related behavior. Rather than focusing on a narrow range of explanatory factors, this review summarizes the literature in a comprehensive, yet theoretically driven manner.

Second, our review assesses this literature's methodological quality, in general, including but not limited to authors' use of theory to guide inquiry and utilization of multivariate analytic methods during analyses. Moreover, the current review compares this literature's methodological quality to quality reported in a past systematic review. For example, of the 69 studies we reviewed, 43 reports (62.3%) explicitly noted the utilization of a theoretical framework to guide investigations. This figure represents a remarkable improvement over what has been previously found by others. In their review of the correlates of early onset of sexual intercourse among female adolescents, for instance, Goodson, Evans, and Edmundson (1997) found that the majority of studies

(69%) reviewed (published from 1984 to 1994) did not report the use of any specific theory or theoretical model. More than half of the studies we reviewed (53.6%) employed a cross-sectional study design, whereas 59% of the studies reviewed by Goodson, et al. (1997) were cross-sectional. Twelve reports (17.4%) we reviewed were based on large-scale, nationally representative samples (e.g., the National Longitudinal Study of Adolescent Health and National Survey of Children). Thirty-one percent of the studies reviewed by Goodson et al. (1997) had analyzed available data sets from these large national surveys. Further, the types of analytic techniques employed in this body of literature are somewhat similar to what has been previously found by others. For instance, Goodson and colleagues (1997) found that the majority of studies (63%) they reviewed utilized univariate-only techniques (i.e., t-tests, ANOVA, and regression, rather than "true" multivariate techniques capable of examining multiple independent and dependent variables). We found 78% of our reviewed studies using univariate-only techniques. Based on our findings, it appears that some indicators of methodological quality may be improving slightly (increased use of theory, longitudinal study designs), whereas some are not (decreased use of data from large national surveys and use of multivariate methods).

Nevertheless, this review suffers from two particular limitations. First, the search strategies we employed, for instance, may have led us to overlook specific studies, especially those neither indexed in the databases searched (i.e., ERIC, MEDLINE, PsycINFO, Sociological Abstracts) nor cited in reviewed papers. Second, we excluded from this review any empirical studies conducted in nations other than the US. Although

this practice allowed us to focus the review on American adolescents, it consequently lowered the number of articles eligible for review. We believe, however, that this was only a minor limitation. For example, some Integrated Theory elements, such as perceived norms and emotions, may vary in their explanatory ability simply because the social construction of these factors varies across cultural contexts (Fishbein, 2000). Thus, including studies with participants from South Africa, Ethiopia, or Jamaica may have limited the generalizability of our findings

Despite these limitations, we uncovered several notable findings with this review. First, intention, or motivation, to have sex was the most consistent predictor of The Integrated Theory elements. That is, all of the eight studies we reviewed which examined intention established the relationship between greater intention to have sex and increased sexual intercourse or earlier intercourse initiation. None of the studies that examined intention identified it as being *unrelated* to adolescents' sexual activity involvement. Such finding constitutes further test of the validity of this theoretical framework, and adds to the theoretical developments within the field of adolescent sexual health.

Second, youth's perceptions of norms (i.e., peer sex behaviors, peer attitudes toward sex, and parental attitudes regarding sex) were fairly consistent predictors of sexual behavior/intention outcomes in this literature. In other words, our reviewed studies found many more findings supporting the notion that norms impact adolescent sexual behavior or intentions, and very few findings indicating *no statistical relationship*. Lastly, studies found increased time alone with the opposite sex (or being

home alone) to be strongly associated with increased sexual activity and early initiation of intercourse. Programmatic activities which focus on these three elements—intention to have sex (or conversely, intention to remain abstinent), perceived norms, and time home alone (possibly through after-school programs)—may yield more desirable effects than efforts focusing on other elements. For instance, modeling studies such as those conducted by Buhi (2006) have found that these variables altogether have a strong association with sexually abstinent behavior, in a sample of middle school students.

Based on our findings, we recommend four areas for future research. One area in need of more focused inquiry pertains to examining the effects of certain variables in The Integrated Theory, such as skills (e.g., refusal skills, etc.), self-standards (e.g., abstinence related-values), and emotions on sexual behavior/intention outcomes. No studies in the current review examined adolescents' refusal or negotiation skills and their subsequent sexual behavior or intention. Further, only four studies assessed the empirical relationship between adolescents' emotions and various sexual behavior outcomes. If we are to better understand The Integrated Theory, as well as these three elements, related to sexual behavior, further research must be conducted.

A second area pertains to the empirical study of parental monitoring/supervision on sexual behavior/intention outcomes. In our review, we found that increased parental monitoring exhibited a largely protective effect on sexual activity initiation; however, many reports noted *no* statistically significant effects. This finding may be a product of investigators' use of multiple instruments or scales to measure parental monitoring. Unfortunately, we did not assess studies' consistent use of the same, or similar,

measurement instruments. More focused study, then, such as meta-analyses, may be warranted so that we can better determine the overall statistical relationship between monitoring and sexual behavior *across* studies.

A third area pertains to the use of theory to guide investigations. We found, in this review, that most investigators employed behavioral theories in carrying out their research. However, it was not uncommon to find multiple theories being used across studies to examine adolescent sexual behaviors, including Social Learning/Social Cognitive Theory, Problem Behavior Theory, Ecological Systems Theory, Theory of Reasoned Action/Theory of Planned Behavior, and Social Control Theory. Although these theories, collectively, address a broad range of salient elements which explain adolescent sexual behavior outcomes, we found no *one* multidimensional theory—encompassing intrapersonal, interpersonal, and environmental factors—being used. Most researchers would acknowledge that adolescent sexual behavior is complex and multifaceted (Moore, Miller, Glei, & Morrison, 1995); however, researchers' (and practitioners') use of theory must reflect this complexity. The Integrated Theory is such a multidimensional model, and its utility may hold promise for sexuality educators and sex behavior researchers.

A fourth and final area pertains to the quality of research methodologies employed. The majority of studies we reviewed did not utilize a longitudinal or prospective study design, did not recruit participants through random sampling procedures, and were not based on large-scale, nationally representative samples. These limitations lead to challenges in result interpretation: increased difficulty in establishing

causative relationships (due to the lack of temporal priority of the variables of interest), lack of control for selection biases, and inability to generalize the research findings. Tables IV.1 and IV.2 follow.

Table IV.1. Summary of the 8 Integrated Theory Elements' Associations with Adolescent Sexual Behavior/Intention Outcomes

(+) INTENTION TO HAVE SEX

- Sexual intercourse or intercourse initiation
- Participation in sexual behaviors
- Greater heterosocial risk (being involved in a greater number of sexual possibility situations such as kissing a peer of the opposite sex and progressively riskier situations)

NORMS

(-/0) Perception of peer sex behaviors (believing *most peers have had sex*)

- Intention to have sex
- Early sexual onset
- Subsequent sexual behaviors or intercourse
- Unrelated to sexual intercourse intentions, ever having had sexual intercourse, sexual activity for African Americans or Hispanics, risky sexual behavior, intercourse frequency, number of sex partners, age at first intercourse, or early sexual initiation

(+/0) Perception of peer disapproval of sex or negative attitudes toward sex

- Intention to remain abstinent
- Sexual abstinence
- Delayed sexual initiation
- Lower frequency of sexual intercourse
- Lower number of sex partners in the last year
- Less involvement in other intimate behaviors
- Unrelated to sexual intercourse initiation or risky sexual behavior

(+) Perceived parental disapproval of engaging in sexual intercourse

- Sexual abstinence
- Lower occurrence of sexual intercourse
- Lower heterosocial risk

(0) SKILLS

- No findings

(+) PRO ABSTINENCE SELF-STANDARDS

- Delayed initiation of sexual intercourse
- Sexual abstinence

(+/0) SELF-EFFICACY

- Self-efficacy to resist peer pressure to have sex – related with not having had sex
- Self-efficacy to negotiate safer sex, but not partner communication self-efficacy – associated with consistent refusal of unwanted sex
- Related to intention to remain abstinent
- Related to delayed initiation of intercourse, not engaging in sexual activity

(+/0) NEGATIVE EMOTIONS REGARDING SEX/POSITIVE EMOTIONS TOWARD SEXUAL ABSTINENCE

- Greater intention to remain abstinent
- Decreased subsequent sexual behaviors
- Girls who expect more positive consequences from teenage childbearing are more likely to engage in sexual risk behaviors which place them at increased risk for pregnancy
- Emotionality unrelated to sexual abstinence

Table IV.1 continued

(+/0) <u>POSITIVE ATTITUDES TOWARD ABSTINENCE/FEWER SEXUALLY PERMISSIVE ATTITUDES</u>

- Lowered intention to have sex
- Decreased sexual intercourse in the last year
- Delayed onset of sex
- Attitudes (but not behavioral beliefs) are related to sexual intercourse intentions and ever having had sexual intercourse
- General attitude is associated with intentions to have sex, but outcome beliefs are not associated with intentions or behavior
- Expected consequences are associated with engaging in sex for boys but not for girls
- Sex attitude (sex avoidance), for males but not for females, is associated with reduced likelihood of intercourse
- Unrelated to intention to have sex or sexual initiation

<u>ENVIRONMENTAL CONSTRAINTS</u>

(+/0) Greater Parental Monitoring/Supervision

- Earlier initiation of sex
- Greater frequency of sex
- Greater number of sex partners
- Delayed sexual activity for girls but not for boys
- Higher sexual behavior risk
- Decreased intention to have sex
- Unrelated to sexual intercourse, age at first intercourse, frequency of sexual intercourse, sexual activity, the number of sex partners in last year/lifetime, or heterosocial risk

(+/0/-) Increased Parental Support

- Reduced likelihood of engaging in sex
- Only among 9th grade females is increasing parental support related to delayed initiation of intercourse
- Predictive of intercourse for White but not for African American females
- For girls only, mother's *extrinsic* support, but not intrinsic support, is predictive of sexual onset
- Maternal support associated with intercourse frequency, but not age at first intercourse or number of sex partners
- Unrelated with delayed onset of intercourse/timing of intercourse, sexual activity, intercourse frequency in the last year, the number of sex partners in last year, the number of lifetime sex partners, or consistent refusal of unwanted sex
- Early sexual onset
- Greater sexual initiation intention

(0) Increased Peer Support

- Unrelated to sexual intercourse, delayed initiation of intercourse, risky sexual behavior, intercourse frequency in the last year, the number of sex partners in last year, or the number of lifetime sex partners

(-/0) Fewer Rules/Boundaries

- Greater risk of becoming sexually active
- Unrelated to initiation of sexual intercourse, intercourse frequency in the last year, the number of sex partners in last year, or the number of lifetime sex partners

(+/0) Higher Quality of Relationship with Parents

- Delayed sexual intercourse initiation
- Delayed sexual intercourse initiation for girls but not for boys
- Unrelated to intercourse occurrence or with delayed initiation of sexual intercourse

Table IV.1 continued

(+/0) Greater Parental Involvement/Closeness

- Parental closeness, except for the father-son dyad, and shared activities with mother only is strongly associated with sexual intercourse
- Greater parental communication is related to greater sexual activity; Closeness, attachment, and warmth are not associated with sexual activity
- Time spent with mother is associated with delaying first intercourse for females but not for boys
- Unrelated with initiation of sexual intercourse

(-) Increased Time Home Alone

- Earlier initiation of sexual intercourse
- Increased sexual activity

NOTE: (-) Indicates this element is a risk factor, (+) indicates a protective factor, (0) indicates a non-statistically significant finding.

Table IV.2. Matrix of the 69 Reviewed Studies, and Their Methods, Findings, and Methodological Quality Indicators

ID #	Lead Author	Pub Yr	DVs	IVs	Theoretical Framework	Ss	Sample Characteristics	Sample Design	Study Design	Analytic Methods	Findings
1	Aronowitz	2005	Hetersocial risk behaviors (HRBs; the # of times girls reported being in a potentially risky heterosocial situation)	Behavioral intentions, perception of norms, connectedness to mother, monitoring	Information, Motivation, & Behavioral Skills Model	39	Ages 11-14, M=12.4, all AA	Non-random, non-national	Interview, cross-sectional	Bivariate correlations and t-tests	Behavioral intentions, perception of norms of both mother and peers protective of heterosocial risk
2	Bachanas	2002	Risky sexual behavior (an index of previous experience of willing intercourse, # of sexual partners in last 60 days, % of encounters where condoms were used, history of STIs, and pregnancy)	Perceived social support, peer norms, sexual self-efficacy	Risk and Protective Model	158	AA girls aged 12-19 years, who were patients in an adolescent primary care clinic	Non-random, non-national	Cross-sectional quantitative survey	Multiple regression	The impact of peer norms, perceived social support, and sexual self-efficacy was not significantly associated with risky sexual behavior when entered into the full model (controlled by other variables)
3	Baker	1999	Ever had sex	Perception of indirect parental monitoring and direct parental monitoring	None	174	Adolescent females at an urban adolescent clinic	Random sampling from the clinic lists, non-national	Cross-sectional quantitative survey	Logistic regression	Perception of indirect parental monitoring and direct parental monitoring were not related to sexual intercourse
4	Baumer	2001	Age at first intercourse, frequency of sexual intercourse in last 4 weeks, # of sex partners in last year	Parental monitoring, peers' pro-childbearing attitudes/behavior	Wilson's Model of Relative Neighborhood Disadvantage	1111	NA	National random sampling (National Survey of Children)	Quantitative survey, longitudinal	Proportional hazards model (conducts regression analysis of survival data)	Age at first intercourse and Frequency of sexual intercourse - church attendance and peers' pro-childbearing attitudes/behavior was predictive. # of sex partners in last year - only peers' pro-childbearing attitudes/behavior was predictive. Monitoring was not predictive for any sex outcomes
5	Bersamin	2005	Ever had sex	Perceived peer attitudes, positive expectancies, negative psychosocial expectancies	None	870	Ages 12-16	Non-random, non-national	CATI interview, longitudinal and quantitative	Logistic regression	Perceived peer attitudes, positive expectancies, negative psychosocial expectancies had NS relationships with sexual initiation

Table IV.2 continued

ID #	Lead Author	Pub Yr	DVs	IVs	Theoretical Framework	Ss	Sample Characteristics	Sample Design	Study Design	Analytic Methods	Findings
6	Benda	1996	Intercourse frequency in last year, # of sex partners in last year, # of lifetime sex partners	Parental supervision, mother strictness (RULES), family support, friends' support	Social Control, Social Learning, and Strain Theories	357	Adolescents aged 13-17 years residing in families on welfare in 10 rural counties in Arkansas	Non-random, non-national	Cross-sectional quantitative interview survey	HLM	None of the predictors were associated with intercourse frequency in last year, # of lifetime sex partners, or # of sex partners in last year.
7	Benda	1998	Intercourse frequency in last year, # of lifetime sex partners	Parental supervision, family support, friends' support	Social Control, Social Learning, and Strain Theories	414	Adolescents aged 13-17 years residing in families on welfare in 10 rural counties in Arkansas	Non-random, non-national	Cross-sectional quantitative survey	Logistic regression	Supervision and friend support were not predictive of sexual intercourse for white or AA females. Family support was predictive of intercourse for white but not for AA females. Family support and friend support were not predictive of # of sexual partners among white or AA females. Supervision was predictive of # of sexual partners for whites but not for AAs. For both white and AA males, supervision, friend support, and parent support were not related to either sexual intercourse or # of sexual partners.
8	Benda	2002	Frequency of sexual intercourse	Parental monitoring and peer association	Attachment Theory, SLT	1093	grades 9-12, 59% white, 36% AA, 2% Hispanic, 54% female	Random, not national	Quantitative survey, cross-sectional	SEM	Parental monitoring and peer association was strongly predictive of frequency of sex
9	Blinn-Pike	2004	Ever had sex	Fear-based postponement, Emotionality and confusion, Conservative values	Resiliency Theory	568	NA	Non-random, non-national	Quantitative survey, longitudinal	Logistic regression	Only conservative values predicted sexual abstinence
10	Browning	2004	Onset of sexual intercourse	Family attachment and support, Supervision (monitoring), positive peer attachment	Collective Efficacy Theory	915	12-15 year olds, 48% Latino, 33% AA, 16% white, ~50% female	Random, not national (Project on Human Development in Chicago Neighborhoods)	Cross-sectional quantitative survey	Multi-level discrete-time event-history analysis	Family attachment and support exerted a protective effect against early sexual onset. Supervision (monitoring) and positive peer attachment did not.
11	Capaldi	1996	Onset of sexual intercourse	Parental monitoring	None	201	4th grade boys in schools in higher crime areas in a med-sized metro area in Oregon	Non-random, non-national	Quantitative survey and interviews, longitudinal	Event history analysis/logistic regression	Parental monitoring did not significantly predict timing of intercourse when controlling for other variables

Table IV.2 continued

ID #	Lead Author	Pub Yr	DVs	IVs	Theoretical Framework	Ss	Sample Characteristics	Sample Design	Study Design	Analytic Methods	Findings
12	Carvajal	1999	Ever had sex	Social norms, self-efficacy to refrain from sex, beliefs about postponing sex	TRA, TPB, SCT	827	Adolescents in Texas participating in a randomized trial to evaluate Safer Choices curriculum	Random, non-national	Quantitative survey, longitudinal	Proportional hazards model (conducts regression analysis of survival data)	Social norms and beliefs about postponing sex were associated with delaying onset of sex, while self-efficacy to refrain from sex was not associated
13	Chewning	1998	Ever had sex	Parental support, peer support	PBT	1341	Wisconsin adolescents in grades 7, 9 and 11; 87% white	Non-random, non-national	Quantitative survey, longitudinal	Multiple regression	Only 9th grade females had a significant finding: increasing parental support was predictive of delayed initiation of intercourse.
14	Cleveland	2003	Occurrence of sexual intercourse in relationships	family relationship, sex-related attitudes (sex avoidance and sex attraction)	Evolutionary Socialization Theory, Paternal Investment Theory	724	Only citations provided regarding sample descriptions	National random sampling (Add Health Survey)	CATI interview, longitudinal and quantitative	Logistic regression	Only sex avoidance for males was associated with reduced likelihood of intercourse
15	Collazo	2004	Intention to abstain from sexual intercourse	Attitude, subjective norm, self-efficacy, anticipated emotional reaction	TRA, TPB, Theory of Interpersonal Behavior	431	grades 10-12, ages 15-19, 65% female, all Puerto Rican	Random sampling of schools from regions in Puerto Rico	Self-administered quantitative survey	Regression	Attitude did not predict intention to remain abstinent. All other IVs were predictive of intentions
16	Davis	2001	Onset of sexual intercourse	Quality of mother-child relationship, mother approval of adolescent sex	None	763 girls 904 boys	71% white, 13% AA, 10% Latino	National random sampling (Add Health Survey)	CATI interview, longitudinal and quantitative	Proportional hazards model (conducts regression analysis of survival data)	Higher quality of mother-child relationship had a protective effect on initiation of sexual intercourse for girls only. Mother's disapproval of adolescent sex is associated with less of a likelihood of early sex.
17	DiClemente	2001	Refusing unwanted sex	Family support, safer sex self-efficacy, partner communication self-efficacy	None	522	Clinic and school-based sample of AA girls	Non-random, non-national	Cross-sectional quantitative survey	Logistic regression	Self-efficacy to negotiate safer sex was associated with consistent refusal of unwanted sex, whereas family support and partner communication self-efficacy were not.

Table IV.2 continued

ID #	Lead Author	Pub Yr	DVs	IVs	Theoretical Framework	Ss	Sample Characteristics	Sample Design	Study Design	Analytic Methods	Findings
18	Dilorio	2001	Ever had sex	Self-efficacy for resisting pressures to have sex, personal and social outcome expectancies for not having sex, and perception of peer attitudes toward adolescents having sex	SCT	405	Mean age = 13.86, 56% male, 82% AA	Non-random	Quantitative interview, cross-sectional	Logistic regression	Participants who expressed more favorable personal outcomes for not having sex were less likely to have initiated sexual intercourse than those who held less favorable personal outcome expectancies. Participants who perceived their friends as holding less favorable views toward adolescents having sex were less likely to have initiated sexual intercourse than those who held more favorable attitudes toward adolescents having sex. SE to resist peer pressure to have sex also predicted not having had sex.
19	DiIorio	2004	Ever had sex	Sexual possibility situations (index of: time spent with opposite sex, time with others without adults), self-efficacy for abstinence, outcome expectations, perception of parental involvement and of parental rules, parent-child communication, personal standards, perceived peer norms	PBT	491	61.5% boys, 11-14 years of age, mean age = 12.3 years, 98.6% AA	Non-random, non-national	Quantitative interviews	Logistic regression	Only time alone with opposite sex and personal values (standards) were statistically significant predictors of initiation of sexual intercourse.
20	Dittus	1999	Onset of sexual intercourse	Motivations and beliefs for engaging in sex (moral, parental, social and interpersonal, disease, and negative pregnancy consequences)	Model of Maternal Influence	751	~50% male, all AA adolescents, mean age = 15 years, Philly metro area	Random, non-national	Cross-sectional quantitative interview survey	Multiple and logistic regressions	All beliefs with the exception of moral consequences and disease consequences predicted onset of sexual intercourse.

Table IV.2 continued

ID #	Lead Author	Pub Yr	DVs	IVs	Theoretical Framework	Ss	Sample Characteristics	Sample Design	Study Design	Analytic Methods	Findings
21	Dittus	2000	Ever had sex	Adolescent perceived maternal disapproval of sex, satisfaction with maternal relationship	None	8275	71% white, 13% AA, 10% Latino	National random sampling (Add Health Survey)	CATI interview, longitudinal and quantitative	Logistic regression	Adolescent perceived maternal disapproval of sex, and adolescent satisfaction with maternal relationship predicted the occurrence of sexual intercourse.
22	Donnelly	1999	Ever had sex	Attitudes, behavioral intentions	None	839	Inner-city adolescents in NJ	Non-random, non-national	Cross-sectional quantitative survey	Logistic regression	Intentions not reported, and "a number of sexuality-related attitudes did prove to be predictors of sexual abstinence" (p. 210). However, some attitudes must have not been predictive. Although, these are not reported.
23	Faryna	2000	Ever had sex	AIDS Risk Self-Efficacy Scale for Sexual activity (ARSES), AIDS knowledge attitudes and beliefs scale (KABS)	Self-Efficacy Theory	427	12-20 year old HS students	Non-random, non-national	Cross-sectional quantitative survey	Logistic regression	Authors noted that ARSES for sexual activity and the KABS had a "lack of contribution to sexual behaviors" but reported statistically significant odds ratios.
24	Flores	2002	Intentions to have sex	General social norms, general attitude	TRA	84	Mexican-American and Central American adolescent females, aged 14-19, residing in CA and TX	Non-random, non-national	Telephone interview survey	Regression	Only social norms predicted intentions to have sex in the next month.
25	French	2001	Onset of sexual intercourse	Monitoring, relationship quality	PBT	162	Mean age = 12.2 at baseline, range = 10-14 years, 90% white	Non-random sample, longitudinal study of virgins at baseline	Quantitative surveys and interviews	Event history analysis	No predictors were independently associated with initiation of sexual intercourse
26	Gillmore	2002	Ever had sex (this includes anal or vaginal)	Intentions to have sex, general attitude toward sex, general norms, outcome beliefs, and normative beliefs	TRA	749	32% = 10th grade, 31% = 11th grade, 37% - 12th grade; 53% female; 47% white, 20% AA, 22% Asian	7-year longitudinal study in NW US, non-random	Quantitative interview survey, longitudinal	SEM	Sexual intercourse was associated with intentions to have sex. In turn, intentions were associated with both general attitude and general norm.
27	Huebner	2003	Low or high sexual risk, based on # of lifetime sexual partners and condom use at last sex	Perception of parental monitoring, frequency of parent-child communication, & parenting style	Family systems theory	1160	50% female, 49% white, 45% AA, mean age = 15.7 years, 7-12 graders	Non-random, non-national	Cross-sectional quantitative survey	Logistic regression	Only perception of parental monitoring significantly predicted the probability of adolescent risk-taking.

Table IV.2 continued

ID #	Lead Author	Pub Yr	DVs	IVs	Theoretical Framework	Ss	Sample Characteristics	Sample Design	Study Design	Analytic Methods	Findings
28	Kinsman	1998	Onset of sexual intercourse, Intention to initiate sex	Intention to initiate sex, 3 types of norms: perception of the prevalence of sex among their peers, the normative age for initiating sexual intercourse, perception of the social gains/stigmas associated with early sex	None	1389	6th graders in Philly, mean age = 11.7 years	Non-random, non-national	Quantitative survey, longitudinal	Logistic regression	Intention to initiate sex was the strongest predictor of sexual initiation. Only boys believing that they would gain status or respect by being known as having had sexual intercourse was associated with sexual initiation. In predicting intentions to have sex, only students who believed that most of their peers have had sex were likely to report a greater intention to have sex.
29	Lammers	2000	Onset of sexual intercourse	Perceived availability of a caring adult (support), parental expectations in general	None	15624	Demographics reported for the larger sample.	Non-random, statewide survey	Cross-sectional quantitative survey	Proportional hazards model (conducts regression analysis of survival data)	High parental expectations were predictive of delayed onset of sexual activity for males, but not for females. Perceived availability of a caring adult (support) was not a significant predictor.
30	Li	2000	Sexual behavior (3 questions from the Youth Risk Behavior Inventory)	Perceived parental monitoring	PBT	455, 355, 349 for 3 data collection waves	Mainly urban, low income, AA adolescents and children	Non-random, non-national	Cross-sectional quantitative survey	MANOVA	Perceived parental monitoring was inversely associated with sexual behavior in all 3 samples (low levels of monitoring = more sexual risk).
31	Longmore	2001	Ever had sex	Parental support and parental monitoring	None	538	54% female, 78% white, 10.5% AA, 8% Latino	National random sampling (the National Survey of Families and Households), longitudinal (2 waves of data collection)	Quantitative interview survey	Proportional hazards model (conducts regression analysis of survival data); Event history analysis	Parental monitoring was the only significant parenting strategy that predicted timing of intercourse. Parental support did not predict intercourse.
32	Lynch	2001	Sexual activity (measured as higher sexual intercourse and earlier debut)	Family interaction/bonding (high parental monitoring, high maternal caring, stricter attitude toward sex & BC)	PBT, Bronfenbrenner's Ecological Systems Theory	1372 7-8 grade & 2515 9-12 grade	NA	National random sampling (National Longitudinal Survey of Youth)	Cross-sectional quantitative survey	SEM	Family interaction/bonding did not directly predict sexual activity; rather it indirectly predicted sexual activity through academic achievement or self-esteem.

Table IV.2 continued

ID #	Lead Author	Pub Yr	DVs	IVs	Theoretical Framework	Ss	Sample Characteristics	Sample Design	Study Design	Analytic Methods	Findings
33	Mandara	2003	Ever had sex	Parental monitoring	Ecological framework	101	15 and 18-year old AA adolescents in So. Cal., 47% female	Non-random, non-national	Quantitative survey	SEM	In univariate analyses, parental monitoring was predictive of sexual activity. However, when other variables were added into the model, such as age, reporting of alcohol and other drug use, and friends' deviant behaviors, monitoring was no longer predictive. Instead, monitoring predicted sexual activity through drug use.
34	Marin	2000	Ever had sex	Perceived peer norms	None	2829	Six-grade students in 19 urban middle schools in No. California	Non-random, non-national	Cross-sectional quantitative survey	Multi-level logit models	Peer norms predicted early sexual onset for both boys and girls.
35	Meier	2003	Onset of sexual intercourse	Personal sex attitudes, relational sex attitudes	None	4948	Only citations provided regarding sample descriptions.	National random sampling (Add Health Survey)	CATI interview, longitudinal and quant.	Regression	For both males & females, more permissive or positive personal & relational attitudes about sex were significant predictors of first sex.
36	Miller	1997	Onset of sexual intercourse	Mother intrinsic support, mother extrinsic support, friends had sex at 16 (NORMS)	None	1145	386 females, 373 males	National random sampling (National Survey of Children)	Quantitative survey, longitudinal	Event history analysis/logistic regression	For boys: Only friends had sex at 16 (NORMS) was predictive of sexual onset. For girls: mother extrinsic support and friends had sex at 16 (NORMS) were predictive of sexual onset.
37	Miller	1998	Asking 8 intimate sexual behavior questions (the final DV was the most advanced behavior listed by the adolescent)	Sexual abstinence attitudes, sexual intentions in the next year (INTENTIONS)	Biological and Social Learning Conceptual Frameworks	473	235 males, 238 females; 85% Mormon; 95% white; sample in Utah school districts	Non-random, non-national	Quantitative survey, longitudinal	SEM	Greater sexual abstinence attitudes significantly predicted a weaker intention to be sexually active and lesser sexual behavior. Sexual intentions in the next year (INTENTIONS) significantly predicted subsequent sexual behavior.
38	Miller	1999	Age at first intercourse, Frequency of intercourse (# of times in lifetime)	Parental monitoring, mother-adolescent general communication (maternal support)	SLT	907	Montgomery, AL, NYC, and Puerto Rican high schoolers	Non-random, non-national	Cross-sectional quantitative interview survey	HLM	Increases in maternal monitoring are related to less frequent adolescent sexual intercourse, fewer sexual partners, and age at first intercourse. Increases in maternal support is related to less frequent adolescent sexual intercourse and fewer sexual partners for youth in AL and NY, but not in PR.

Table IV.2 continued

ID #	Lead Author	Pub Yr	DVs	IVs	Theoretical Framework	Ss	Sample Characteristics	Sample Design	Study Design	Analytic Methods	Findings
39	Miller	2000	Intercourse frequency, # of sex partners, age at first intercourse	Parental monitoring, maternal communication (SUPPORT), perceived peer sexual activity, perceived neighborhood safety	Multi-System Model (guided by Bronfenbrenner's Ecological Systems Theory)	907	AA and Hispanic adolescents, aged 14-17 years	Non-random, non-national	Cross-sectional quantitative interview survey	HLM	Only communication with mother and peer group sex significantly predicted intercourse frequency. Only parental monitoring and neighborhood quality predicted # of sex partners. None of the predictors significantly predicted age at first intercourse.
40	Mitchell	2004	Sexual intentions	Peer pressure, parental support	PBT	197	Age range = 14-18 years, 72% in grade 9, 55% male	Non-random, non-national	Cross-sectional quantitative survey	ANOVA	Peer pressure was not associated with intention. Parental support was associated with sexual initiation intention.
41	Mott	1996	Onset of sexual intercourse	Home emotional support	None	450	NA	National random sampling (Nat Longit. Survey of Youth)	Quantitative survey, longitudinal	Logistic regression	Home emotional support was not predictive of delaying sexual activity.
42	Nahom	2001	Ever had sex	Intentions to have sex, perception of prevalence of peer intercourse, pressure to engage in sex	None	1173	Urban youth in the Pacific NW	Non-random, non-national	Quantitative survey, longitudinal	ANOVA	Association between intention to have sex and sexual intercourse; association between perceptions of peers' sex; association between peer pressure and having sex.
43	O'Donnell	2003	Ever had sex	Peer sex norms, sex outcome expectancies related to sexual behavior, attitudes about sexual responsibility, and refusal skills.	SCT	849	Economically disadvantaged Brooklyn middle schoolers	Non-random, non-national	Quantitative in class survey, longitudinal	ANOVA	7th graders who express positive statements about sexual norms, expectancies, responsibilities, and refusal attitudes were more likely to delay sexual initiation. In contrast, those who express attitudes supportive of early sex were more likely to engage in such behavior.
44	O'Sullivan	2005	Sexual intercourse with male partners	Abstinence attitudes, perceived parental and peer approval	Cognitive Theory of the Self	162	62% Latina, 32% AA	Non-random, non-national	Quantitative interview survey, longitudinal	MANOVA	Girls who had no intercourse experience over the study have stronger abstinence attitudes compared to the transitioners. Further, girls with sexual intercourse experience perceived stronger peer approval for sexual experience.
45	Perkins	1998	Ever had sex	Parental monitoring, perceived family support, time home alone	Ecological, Risk-factor Model	15362	53% females, mostly white	Non-random, non-national	Cross-sectional quantitative survey	Logistic regression	Being home alone predicted sex for all ethnic groups, & for both genders. Parental monitoring & family support were not sig. predictors for males or females.

Table IV.2 continued

ID #	Lead Author	Pub Yr	DVs	IVs	Theoretical Framework	Ss	Sample Characteristics	Sample Design	Study Design	Analytic Methods	Findings
46	Porter	1996	Ever had sex	Perceived costs and benefits of early sex, personal norms	None	228	About 50% male, the 8th graders were mostly AA (43%) and white (38.9%), while the 5th graders were mostly white (66%) and Hispanic (19.6%). SE Michigan industrial city.	Non-random, non-national	Cross-sectional quantitative survey	SEM	Perceived costs and benefits of early sex, and personal norms did not directly predict sexual intercourse. They did, however, indirectly predict intercourse through the mediating variable of other intimate behaviors, which strongly predicted intercourse.
47	Porter	1999	Ever had sex	Expected negative consequences (costs) and expected positive consequences (benefits) of having sexual intercourse (BELIEFS)	None	52	Public school students in 6th and 9th grades, in a Midwest industrial city	Non-random, non-national	Quantitative survey, longitudinal	Logistic regression	Expected negative consequences (costs) and expected positive consequences (benefits) of having sexual intercourse (BELIEFS) were not predictive of adolescents' initiation of sexual intercourse at a second time point.
48	Ramirez-Valles	2002	Onset of sexual intercourse	Parental involvement (time with mother & time with father)	Social Control Theory	558	Ages 14-16 at time of first interview, all AA, 58% female	Non-random, non-national, recruited from 4 high schools in Michigan	Quantitative interview and written surveys, longitudinal	Proportional hazards model (conducts regression analysis of survival data)	Among females, time spent with mother was correlated with delaying first intercourse. No predictors correlated with delaying first intercourse for males.
49	Ream	2005	Ever had sex	Parental closeness, shared activities with parents	PBT, Social Control Theory	4895 boys, 5512 girls	71% white, 13% AA, 10% Latino	National random sampling (Add Health Survey)	CATI interview, longitudinal and quantitative	SEM	Closeness for all dyad types, except for the father-son dyad, and shared activities with mother only strongly predicted sexual intercourse.
50	Robinson	1998	Ever had sex	Attitudes towards being a teen parent, efficacy expectations of not engaging in sexual intercourse, benefits of being a teen parent, barriers to being a teen parent	HBM, TRA, SCT	689	Mean age = 13.5 years; 51% male; 92% white; rural junior high schools in NW Ohio	Non-random, non-national	Cross-sectional quantitative survey	logistic regression	Attitudes and efficacy expectations significantly predicted intercourse for males, while efficacy expectations were the only predictor significantly associated with engaging in intercourse.

Table IV.2 continued

ID #	Lead Author	Pub Yr	DVs	IVs	Theoretical Framework	Ss	Sample Characteristics	Sample Design	Study Design	Analytic Methods	Findings
51	Robinson	1999	Ever had sex	Intentions, perceptions (NORMS), efficacy expectations (SELF-EFFICACY), social support (FAMILY SUPPORT), expected consequences	Social Support, SCT	683	Urban, Midwest county 6th graders, mean age = 11.6 years, 50% male	Non-random, non-national	Cross-sectional quantitative survey	Logistic regression	For boys and for girls, as social support for not engaging in sex increased the likelihood of not engaging in sex increased. Perceptions (NORMS) predicted engaging in sex for boys only. Efficacy expectations (SELF-EFFICACY) predicted engaging in sex for both boys and girls, whereas expected consequences were predictive only for boys.
52	Roche	2005	Onset of sexual intercourse	Parental involvement, parental decision making (similar to rules)	Social Ecological Theory	2559	Middle school students	National random sampling (Add Health Survey)	CATI interview, longitudinal and quantitative	Logistic regression	Parental involvement did not significantly influence onset of intercourse; parental decision making (less rules = more at risk of becoming sexually active) and deviant peers did.
53	Romer	1999	Ever had sex, ever had anal sex, next year do you think you will have sex with someone	Attitudes toward engaging in sex, perceived peer prevalence of risk behaviors (NORMS), parental monitoring	None	355	AA youth aged 9-17 years, living in urban public housing	Non-random, non-national	Cross-sectional quantitative computer-assisted survey	Logistic regression	Parental monitoring was predictive of early initiation of sex, and delaying initiation of anal sex. Attitudes toward engaging in sex were predictive of early initiation, but not perceived peer prevalence of risk behaviors.
54	Rose	2005	Intentions to have sex over the next 12 months, initiation of sexual intercourse	Parental monitoring, parent-child relationship quality, parent-child communication	None	408	5th graders in the Washington DC area	Non-random, non-national	Cross-sectional quantitative survey	Logistic regression	Parental monitoring had an influence over intentions but not on sexual intercourse initiations. Less quality relationship with parents for girls = increased odds of having sex.
55	Rosenthal	2001	Onset of sexual intercourse	Parental monitoring	None	143	NA	Non-national, random selection by age from adolescent medicine clinic	Quantitative interview survey, longitudinal	Logistic regression	Youth who reported more direct parental monitoring were older when they initiated intercourse.
56	Rostosky	2003	Ever had sex	Attitudes and beliefs about sexual intercourse	Sexual Socialization and Social Control Theories	3691	Only citations provided regarding sample descriptions.	National random sampling (Add Health Survey)	CATI interview, longitudinal and quantitative	Logistic regression	Sex attitudes predicted the odds of coital debut.
57	Rucibwa	2003	Onset of sexual intercourse	Perceived peer sexual behaviors	None	178	Mean age = 16.5 years, 88 Blacks, 90 Hispanics	Non-random, non-national	Cross-sectional survey	Logistic regression	Perceived peer behaviors were not predictive of sexual activity for Blacks or Hispanics.

Table IV.2 continued

ID #	Lead Author	Pub Yr	DVs	IVs	Theoretical Framework	Ss	Sample Characteristics	Sample Design	Study Design	Analytic Methods	Findings
58	Santelli	2004	Onset of sexual intercourse	Self-efficacy for resisting pressure, personal and perceived peer norms about refraining from sex	Behavior Science Theory	1270-1637	NA	Non-national, multi-stage cluster sampling of 46 inner city schools in 3 NJ school districts	Quantitative in class survey, longitudinal	Logistic regression	By the end of 7th grade and again at the end of 8th grade, personal and perceived peer norms about refraining from sex and self-efficacy both predicted initiation of sexual intercourse.
59	Sieverding	2005	Onset of sexual intercourse, Intention to initiate sexual intercourse	Intention to initiate sex; Cognitive variables: attitude toward sex, subjective norm, perceived peer behavior; Parental monitoring	TPB	307	Mean age = 15.8 (range = 14-18); 57.7% male, 14.7% African American, 25.1% white, 17.3% Latino, 30.0% Asian, and 12.9% mixed race and other	Recruited from HMO, nonrandom, non-national	Prospective (T1, T2, T3)	Bivariate correlation and regression analysis	Parental monitoring and all cognitive variables significantly predicted intention. Only intention significantly predicted sexual initiation.
60	Sionéan	2002	Refusing unwanted sex	Family support, safer sex self-efficacy, partner communication self-efficacy	Theory of Gender and Power, SCT	522	Clinic and school-based sample of AA girls	Non-random, non-national	Cross-sectional quantitative survey	Logistic regression	Self-efficacy to negotiate safer sex was associated with consistent refusal of unwanted sex, whereas family support and partner communication self-efficacy were not.
61	Smith	1997	Early sexual activity (<age 15)	Perception of parental supervision	Ecological Framework	566 boys, 237 girls	Urban teenagers of color (mostly AA and Hispanic)	Non-random, non-national	Quantitative survey, longitudinal	Logistic regression	Lower supervision was related to early sexual activity for boys, but not for girls.
62	Somers	2000	Sexual behavior (18 questions re: intercourse, contraceptive use, etc.)	Perception of parental closeness, warmth, attachment, parent-child communication	None	157	9-12th graders, mean age = 16.2 yrs, 62 boys, 95 girls	Non-random, non-national	Cross-sectional quantitative survey	Canonical correlation analysis	More parental communication = more sex. Closeness, attachment, and warmth were NOT associated with sex.
63	Stanton	1996	Sexual intercourse	Intention to have sex, Extrinsic rewards (perception of peer norms), severity (emotions)	Protection Motivation Theory	119	AA youth aged 9-15 years, living in urban public housing	Non-random, non-national, 6-month longitudinal study	Quantitative survey	Univariate Mantel Haenszel test for linear association	Individuals' sexual intentions at time 1 statistically significantly predicted subsequent sexual behaviors at time 2. Extrinsic rewards (perception of peer norms) and severity (emotions) also predicted subsequent sexual behaviors at time 2.
64	Teitler	2000	Ever had sex	School and neighborhood normative environment (measured through perceived ideal age to have first sex, etc.)	None	1204	Tracts: 51% white, 41% AA	Random, not national (Philadelphia youths in 69 schools)	Telephone and in-person quantitative interviews	Multi-level modeling	The perception of school norms toward sexual initiation predicts the transition to sex; perception of tract (neighborhood) norms did not add any variance explanation.

Table IV.2 continued

ID #	Lead Author	Pub Yr	DVs	IVs	Theoretical Framework	Ss	Sample Characteristics	Sample Design	Study Design	Analytic Methods	Findings
65	Unger	2000	Ever had sex	Perceived consequences of teenage pregnancy (emotions), parental monitoring, communications with parents	HBM, TRA, Protection Motivation Theory	584	All female, Latinas	Random, not national (3 high schools in LA, classrooms randomly selected)	Quantitative classroom survey	Logistic regression	Adolescent girls who expect more positive consequences from teenage childbearing may be more likely to engage in sexual risk behaviors which place them at increased risk for pregnancy.
66	Upchurch	1999	Onset of sexual intercourse	Parental socioemotional support	None	870	Representative sample of youth aged 12-17 in L.A.	Random, not national	Quantitative survey, longitudinal	Proportional hazards model (conducts regression analysis of survival data)	Parental socioemotional support was not associated with onset of sexual intercourse.
67	Villarruel	2004	Sexual intercourse intentions, ever had sex	Attitudes, subjective norm, behavioral beliefs, perceived behavioral control, intentions	TPB	141	77 girls, 64 boys, 79.7% Puerto Rican, 81% non-US born, age range = 12-18 years	Part of larger randomized control trial to prevent HIV in North Philly	Written quantitative survey	Regression	Attitudes, self-pride, and partner approval predicted sexual intercourse intentions; attitudes, intentions, self-pride, parental pride, and partner approval predicted ever had sexual intercourse
68	Watts	2000	Frequency of sexual intercourse	Attitude toward coitus, peer expectations, parent expectations	None	2146	Mostly 9th-10th graders	Non-random, non-national	Cross-sectional quantitative survey	Actual multivariate method unknown (but reported Wilks lambda)	Nonsexually active students reported more positive attitudes toward delaying involvement in sexual intercourse, and perceived greater parental and peer disapproval of engagement in sex.
69	Whitbeck	1999	Intercourse in last year?	Mother monitoring, Warm/supportive parenting, sexually permissive attitudes	Life Course Developmental Perspective	457	Youth in grades 8-10	Non-random, non-national	Quantitative survey, longitudinal	Event history analysis/ logistic regression	Mother monitoring, Warm and supportive parenting (FAMILY SUPPORT) were not associated with sexual intercourse, whereas sexually permissive attitudes were.

Note: AA – African American, HBM – Health Belief Model, PBT – Problem Behavior Theory, SCT – Social Cognitive Theory, SLT – Social Learning Theory, TPB – Theory of Planned Behavior, TRA – Theory of Reasoned Action

CHAPTER V

CONCLUSION

The purpose of this dissertation was three-fold. In a manuscript-style format (rather than the *traditional* five-chapter dissertation layout), I have presented three "free-standing" pieces: 1) a primer on structural equation modeling (SEM) intended for health behavior researchers; 2) results from a SEM analysis of adolescent sexually abstinent behavior and intention to remain abstinent, guided by The Integrated Theory (Fishbein, 2000; Fishbein, Triandis, Kanfer, Becker, Middlestadt & Eichler, 2001), and 3) results from a systematic review of the literature on predictors of adolescent sexual behavior and intention, again, guided by The Integrated Theory.

Results from the structural equation modeling analyses indicate that The Integrated Theory may be very useful in explaining adolescents' intention to remain sexually abstinent and their subsequent sexually abstinent behavior. This component of my dissertation study contributes to the adolescent sexual health literature in three ways. First, despite the utility of past research into the predictors of intention and sexual behavior, to my knowledge, no research efforts have followed The Integrated Theory as a guide. Second, as I documented in Chapter IV, most studies examining adolescent sexual health employ simple univariate or bivariate analytic techniques. My use of SEM strengthens this research (cf. the discussion in Chapter II of the advantages of SEM over bivariate analytical techniques) because the method is ideal for testing and refining theoretical models (my central purpose in Chapter III). Third, unlike most adolescent

sexual behavior research, the current analyses utilized longitudinal data and replication to assess the utility of The Integrated Theory. Studies based longitudinally are more appropriate for documenting cause-and-effect relationships due to the control of the temporal priority of variables (i.e., the cause must *precede* the effect). Further, I validated these variable relationships using a second sample of data. This replication serves to ensure against making a decision based on a single, possibly unusual, outcome or result.

Based on my results, adolescents' intentions to remain sexually abstinent is a strong predictor of staying abstinent, even at a second time point, which is well-supported by many studies of adolescent sexuality. Greater endorsement of abstinence-related standards also predicted 1) stronger beliefs regarding staying abstinent until marriage, 2) a stronger perception that others endorse pro-abstinence norms, and 3) greater confidence (self-efficacy) to remain abstinent until marriage. In turn, stronger beliefs regarding staying abstinent until marriage, a stronger perception that others endorse pro-abstinence norms, and greater confidence to remain abstinent predicted adolescents' intentions to remain abstinent. Both emotions factors (*emotions regarding sex before marriage* and *emotions regarding sexual abstinence*) failed to predict intentions, "washing out" of the analyses in early rounds of model testing.

In terms of environmental constraints, only *days home alone* predicted sexually abstinent behavior and intention. However, for the *replicated model*, this relationship did not hold. For both models, in fact, *days home alone* only moderately predicted adolescents' intentions to remain abstinent. The other perceived environmental

variables—*rules*, *support*, and *time alone with opposite sex*—all had statistically non-significant relationships with abstinent behavior. Additional research may be warranted on the further testing of these environmental constraints.

This study has notable implications for sexuality education practice and sex research. First, this model lends itself to application in practice, as educational programs and curricula can easily supplement the provision of information by focusing on self-standards, perceived norms, self-efficacy, and beliefs regarding sexual abstinence to impact sexual health. Second, educators may wish to shift their attention to male-targeted programming, as boys in this study exhibited weaker endorsements of abstinence-related standards, weaker perceptions of others around them endorsing pro-abstinence norms, and less confidence that they could remain abstinent until marriage. Third, results from this dissertation study support many other studies indicating that *time home alone* is strongly related to intentions and teens remaining abstinent or postponing sexual intercourse (Miller, 2002). Programs may be able to influence adolescent pregnancy risk by involving youth during after-school hours (Manlove, Franzetta, McKinney, Papillo, & Terry-Humen, 2004) or by developing a parental component (designed to increase parent-child closeness or improve parental monitoring/supervision) to accompany sexuality education for youth.

Based on my findings in Chapter III, I believe several implications for future study should be noted. First, I tested The Integrated Theory using a sample of middle school students; however, does the explanatory power of the model and of individual factors (e.g., self-standards, intentions, among others) change with age or when older

(high school) students are examined? Second, in part due to potential selection bias, youth in the current samples were predominantly White, female, and had high educational aspirations (i.e., they planned to graduate from a four-year college). Research studies are needed to examine the impact of The Integrated Theory, and its individual elements, among adolescents in more diverse communities, among groups where educational aspirations are lower, and in settings where youth live in single parent households with little supervision. Third, this study assessed the influence of the perception of peer norms on intentions. Little is known, however, about *actual* peer and social network influences on abstinence and sex behaviors, and these influences must be examined further. Lastly, other than in what is presented in Chapter III, to my knowledge The Integrated Theory has only been applied to a small number of health behaviors in limited settings (CDC AIDS Community Demonstration Projects Research Group, 1999; Kamb, Fishbein, Douglas, Rhodes, Rogers, Bolan, et al., 1998; Sayeed, Fishbein, Hornik, Cappella, & Ahern, 2005; Yzer, Cappella, Fishbein, Hornik, Sayeed, & Ahern, 2004). More empirical testing is needed to assess its application to other sex, preventive, and health-risk behaviors among youth and adolescents (e.g., condom use, STI/HIV screening).

The systematic review of the literature, presented in Chapter IV, contributes to the adolescent sexual health literature in two ways. First, despite the utility of systematic reviews and the availability of several publications regarding the impact of multiple predictors on sexual behavior/intention outcomes, to date none have followed The Integrated Theory as a guide. Rather than focusing on a narrow range of explanatory

factors, this review summarizes the literature in a comprehensive, yet theoretically driven manner. Second, my review assesses this literature's methodological quality, in general, including but not limited to authors' use of theory to guide inquiry and utilization of multivariate analytic methods during analyses.

From this review of 69 peer-reviewed publications, I uncovered several notable findings. First, intention, or motivation, to have sex was the most consistent predictor of adolescent sexual behavior (that is, all studies examining these two variables documented a strong statistical relationship). Second, reviewed studies demonstrated the impact of youth's perceptions of norms (i.e., peer sex behaviors, peer attitudes toward sex, and parental attitudes regarding sex) on sexual behavior/intention outcomes. Third, most of the reviewed studies utilized a theoretical framework to guide investigations. However, more than half employed simple cross-sectional designs, fewer than one in five were based on large-scale, nationally representative samples, and three-quarters employed univariate/bivariate analytic techniques.

Based on these findings, I recommend four areas for future research. First, more research is needed to examine the effects of certain variables in The Integrated Theory, such as skills (e.g., refusal skills, etc.), self-standards (e.g., abstinence related-values), and emotions on sexual behavior/intention outcomes. Second, focused empirical study of parental monitoring or supervision on sexual behavior/intention outcomes, such as meta-analyses, may be warranted so that we can better determine the overall statistical relationship between monitoring and sexual behavior *across* studies. Third, although researchers' use of theory to guide investigations has somewhat improved from what

Goodson and colleagues (1997) noted, it was not uncommon to find multiple theories being used across studies to examine adolescent sexual behaviors. We found no *one* multidimensional theory—encompassing intrapersonal, interpersonal, and environmental factors—being used, I argue that researchers' use of theory must reflect the complex reality to which they're attempting to generalize. The Integrated Theory is such a framework, and its utility may hold promise for sexuality educators and sex behavior researchers. Lastly, the quality of research methodologies in this literature must be improved, including greater attention on using longitudinal or prospective study designs, recruiting participants through random sampling procedures, and analyses based on large-scale, nationally representative samples.

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APPENDIX A

M*PLUS* FINAL MEASUREMENT MODEL SYNTAX

```
TITLE:      January 31, 2006
            CFA (measurement model) with Wave 1 MS time 2 data;
ANALYSIS:   TYPE = general missing h1;
            ESTIMATOR = mlr;
DATA:       FILE IS
            "U:\Eric Backup\Dissertation\Data files\Middle
            School\W1MSnew.dat";
            FORMAT IS FREE;
VARIABLE:   NAMES ARE A1 A2 A3 A4A A4B A4C A4D A4E A4F A7 A8
            A9A A9B A9C A9D A9E A9F A9G B1 C1 E1-E6 Z1-Z3 G3-G5
            H1 I1-I3 L5-L8 L10-L12 N1 N3-N5 O1-O3 P1-P7 R1 R2 R4 R6-
            R8 R11 S1 S2 T2B1;
            MISSING ARE ALL (-9);
            USEVARIABLES E1-E6 L5-L8 L10-L12
            N1 N4 N5 P1 P2 P6 P7 R1 R2 R4 R6-R8 I1 I2 G4 G5;
MODEL:      f1 BY E1@1 E2-E6;
            f2 BY L5@1 L6-L8 L10-L12;
            f3 BY N1@1 N4 N5;
            f4 BY P1@1 P2 P6 P7;
            f5 BY R1@1 R2 R4;
            f6 BY R6@1 R7 R8;
            f8 BY I1@1 I2;
            f9 BY G4@1 G5;
OUTPUT:     SAMPSTAT STANDARDIZED TECH4;
```

APPENDIX B

M*PLUS* FINAL MEASUREMENT AND STRUCTURAL MODEL SYNTAX

```
TITLE:      January 31, 2006
            CFA (measurement model) and structural model with Wave 2 MS
            data testing the Integrated Theory (Fishbein, 2000) to explain
            sexual abstinent behavior and intentions;
ANALYSIS:   TYPE = general missing h1;
            ESTIMATOR = wlsmv;
DATA:       FILE IS
            "U:\Eric Backup\Dissertation\Data files\Middle
            School\W2MSnew.dat";
            FORMAT IS FREE;
VARIABLE:   NAMES ARE A1 A2 A3 A4A A4B A4C A4D A4E A4F A7 A8
            A9A A9B A9C A9D A9E A9F A9G B1 C1 E1-E6 Z1-Z3 G3-G5
            H1 I1-I3 L5-L8 L10-L12 N1 N3-N5 O1-O3 P1-P7 R1 R2 R4 R6-
            R8 R11 S1 S2 T2B1;
            CATEGORICAL ARE B1 T2B1;
            MISSING ARE ALL (-9);
            USEVARIABLES A1 A7 A4D B1 T2B1 S1 Z1 E1-E6 L5-L8
            L10-L12 N1 N4 N5 P1 P2 P6 P7;
MODEL:      f1 BY E1@1 E2-E6;
            f2 BY L5@1 L6-L8 L10-L12;
            f3 BY N1@1 N4 N5;
            f4 BY P1@1 P2 P6 P7;
            T2B1 ON B1 f1 Z1;
            f1 ON f2 f3 S1 Z1;
            f2 f3 S1 ON f4;
            f3 S1 ON A1;
            S1 ON A7;
            B1 ON f1;
            f4 ON A1 A7 A4D;
OUTPUT:     SAMPSTAT TECH4 STANDARDIZED MODINDICES;
```

VITA

Name:	Eric Richard Buhi
Address:	Texas A&M University, Department of Health & Kinesiology, Mail Stop 4243, College Station, TX 77843
E-mail Address:	buhi@hlkn.tamu.edu
Education:	B.A., Sociology, University of Florida, Gainesville, December 1995 M.P.H., Public Health Education, Indiana University, Bloomington, December 1997