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IDENTIFYING THE DIMENSIONS OF REPRODUCTIVE ATTITUDES AND KNOWLEDGE AMONG U.S. ADOLESCENTS AND YOUNG ADULTS

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Identifying the Dimensions of Reproductive Attitudes and Knowledge among U.S. Adolescents and Young Adults

Abstract: Individual attitudes and knowledge predict reproductive behavior such as unintended fertility among adolescents and young adults. However, there is little consensus as to the underlying dimensions these measures represent, how to compare findings across surveys using different measures, or how to interpret the concepts captured by existing measures. To guide future research on reproductive behavior, we propose an organizing framework for existing measures. We suggest that two distinct overarching but multidimensional concepts, *reproductive attitudes* and *reproductive knowledge*, can be used to understand existing research using various measures. We adapt psychometric analytic techniques to conduct exploratory and confirmatory factor analysis on two widely-used datasets, the National Longitudinal Survey of Adolescent to Adult Health (Add Health) and the Relationship Dynamics and Social Life study (RDSL). Although the specific survey measures and sample composition of the two datasets are different, the dimensionality of the concepts and the content of the items used to measure their different latent factors are remarkably consistent across the two datasets. However, we also note the existence of some survey items that do not seem strongly related to any dimension of either construct and some dimensions of the two concepts that may be poorly measured with existing survey questions. Nonetheless, we argue that the concepts of reproductive attitudes and reproductive knowledge are useful for categorizing and analyzing social-psychological measures related to unintended fertility. The results can be used to guide secondary data analyses to predict reproductive behavior, to compare results across datasets, and to structure future data collection efforts.

Key words: attitudes; contraception; measurement; unintended fertility

Attitudes and knowledge about pregnancy and contraception are important determinants of reproductive behavior (Brückner, Martin, and Bearman, 2004; Craig, Dehlendorf, Borrero, Harper, and Rocca, 2014; Deptula, Henry, Schoeny, and Slavick, 2006; Garfield et al., 2016; Hayford and Guzzo, 2013; Jaccard, Dodge, and Dittus, 2003; Ryan, Franzetta, and Manlove, 2007; Shneyderman and Schwartz, 2013). Yet despite (or perhaps because of) the massive body of research studying this relationship, there is no clear consensus as to the types of attitudes and knowledge that are important for understanding reproductive outcomes or the degree to which current surveys capture attitudes and knowledge. One challenge in building consensus in this body of research is the range of different concepts and measures used to predict outcomes. For instance, Jaccard, Dodge, and Dittus (2003) found that subsequent teen pregnancy rates are higher among adolescents who agree that "It would not be all that bad if I got pregnant at this time in my life" and disagree that "Getting pregnant at this time in my life is one of the worst things that could happen to me." In contrast, Frost, Lindberg, and Finer (2012) report that agreeing with the statement "Every pregnancy is a blessing" is not significantly associated with contraceptive use in a sample of unmarried young adults. It is not clear whether the apparent contradictions across studies reflect true differences in the way attitudes are linked to various outcomes across samples and age groups or are simply the result of measurement differences.

In this paper, we draw on existing theories, two datasets, and psychometric methods to propose an organizing conceptual framework for studying attitudes and knowledge that predict reproductive behavior. Our primary goal is to describe the relationship among the various questions that have been used to measure attitudes and knowledge in previous research. We do not test the predictive power of attitudes or knowledge – which has already been amply demonstrated – or attempt to discern which dimensions are most strongly predictive. Rather, we

seek to systematically identify the different underlying factors linked to reproductive behavior and analyze the extent to which measures currently available in widely used surveys appear to capture those factors.

To address these ambitious goals, we focus on adolescents and young adults in the United States and propose two core concepts: 1) reproductive attitudes about preventing conception, and 2) reproductive knowledge. We apply factor analysis to two datasets, the widely-used National Longitudinal Study of Adolescent to Adult Health (Add Health) and the newer Relationship Dynamics and Social Life study (RDSL), to identify the dimensions of these concepts. We concentrate on measures linked to contraceptive use, the primary source of variation in reproductive outcomes in this population (Lindberg, Santelli, and Desai, 2016; Sweeney and Raley, 2014; Santelli et al., 2004; Santelli, Lindberg, Finer, and Singh, 2007). The focus on adolescents and young adults is driven by both substantive and practical reasons. Early and unintended fertility rates are high in the U.S. and remain important public health concerns. More than half of pregnancies to women under 25 are unintended, and the unintended pregnancy rate peaks in the late teens and early 20s (Finer and Zolna, 2016). As such, both qualitative and quantitative research on unintended fertility has been heavily concentrated on adolescents and young adults, often with an emphasis on attitudes toward pregnancy and contraception or individual knowledge about pregnancy and contraception (e.g., Craig, Dehlendorf, Borrero, Harper, and Rocca, 2014; Jaccard, Dodge, and Dittus, 2003; Jones, Frohwirth, and Blades, 2016; Galloway, Duffy, Dixon, and Fuller, 2017; Ryan, Franzetta, and Manlove, 2007).

Classifying attitudes and knowledge about reproduction

Multiple theories address the relationships between social psychological characteristics and behavior. Those most widely used by demographers include the theory of planned behavior

(TPB; see Fishbein and Ajzen, 2010; Philipov, Thévenon, Klobas, Bernardi, and Liefbroer, 2009), the traits-desires-intentions-behaviors model (TDIB; see Miller 1994, 1995; Miller, Severy, and Pasta, 2004), and the cognitive-social model (Bachrach and Morgan, 2013). These theories, for the most part, propose complementary rather than competing explanations for reproductive behavior. They all share the understanding that reproductive behavior is determined by a combination of rational, deliberative decision-making and more intuitive or emotionally-driven processes that may be semi- or sub-conscious. Thus, for example, TPB proposes that behavior is shaped by the interaction of intentions, normative environment, and the level of perceived control over behavior, while TDIB hypothesizes that persistent traits (including general attitudes) as well as desires for children drive reproductive intentions and, ultimately, behavior. The cognitive-social model focuses explicitly on "the interplay of automatic and deliberative processes" (Bachrach and Morgan, 2013: 460). A key shared insight from all of these frameworks is that attitudes and knowledge both contribute to the formation of intentions and influence behavior net of intentions. Thus, for example, even a woman who does not want or intend to conceive a child may become pregnant if she does not know how to contracept effectively or if she believes family planning is immoral. And even among women who don't intend to have a child, those who have more positive attitudes toward childbearing are more likely to become pregnant (Hayford et al., 2016).

These frameworks have been used to generate a large body of empirical research on the factors that predict contraceptive use and fertility. However, for the most part they do not provide clear guidelines for organizing the types of attitudes and knowledge that predict behavior, nor do they address the extent to which existing survey measures fully capture these multifaceted concepts. The current work addresses these issues in two ways. First, we attempt to

impose order on the mass of existing measures by proposing two core concepts, attitudes toward preventing pregnancy (hereafter, "reproductive attitudes") and knowledge about contraception and the reproductive process (hereafter, "reproductive knowledge"). These concepts synthesize earlier research by incorporating most of the predictors discussed in existing theoretical frameworks or studied in existing empirical research on contraceptive use and unintended pregnancy. Following longstanding practice in demography (e.g., Coale, 1973; Green, 1969; Heisel, 1968), we separate knowledge about contraception and reproduction from attitudes toward preventing pregnancy because these two domains represent different types of cognitive processes. Attitudes toward preventing pregnancy are internalized notions of reasons to have (or avoid having) children but also reasons to take (or avoid taking) the steps to control reproductive outcomes, whereas knowledge about contraception and reproduction captures the tools necessary to allow individuals to more effectively implement reproductive preferences and goals.

Second, we combine existing research and theory with psychometric methods to draw conclusions about the ways specific measures that are available in current datasets represent reproductive attitudes and knowledge and their underlying factors. Preferably, researchers would use psychometric techniques to explore and identify constructs underlying these items *prior* to using these items in research to draw substantive conclusions. Psychometric analysis is an iterative process involving creating and testing survey measures, conducting exploratory factor analysis to determine whether the measures represent a latent factor or factors revising and re-testing measures, using confirmatory factor analysis to demonstrate the relationship among survey measures and latent factor(s), and validating that the latent factor being measured is sufficiently correlated with gold-standard measures or outcomes (Worthington and Whittaker, 2006). Ideally, the process results in widely accepted measures that can be adopted by different

researchers to operationalize key concepts. For example, many social science surveys include some version of the Center for Epidemiological Studies Depression (CESD) scale, the properties of which have been widely tested and established. As such, both data collectors and researchers have a standard set of survey measures to examine depressive symptoms and their relationship to other characteristics and behaviors. To date, though, this is not how indicators of attitudes and knowledge about reproduction have been generally developed and used in the demographic literature, making it difficult to synthesize the findings. This difficulty, in turn, reinforces the piecemeal approach to choosing measures in secondary data analyses and likely contributes to variation in what measures will be included in future data collection efforts. Our goal in this article is not to explicitly identify new measures: rather, we seek to understand how to better use and interpret the multiple measures that already exist in large population-based datasets. Moreover, we also note where existing measures appear to be weakly linked or unrelated to concepts or when underlying factors are measured with very few survey questions.

In our conceptualization, *reproductive attitudes* incorporate both attitudes toward pregnancy and childbearing and attitudes toward contraception. Our conceptualization follows earlier frameworks that treat attitudes toward pregnancy and attitudes toward contraceptive methods as distinct but related predictors of reproductive behavior (e.g., Lee and Bulatao 1983; Miller, 1986). These attitudes are sometimes framed in different ways theoretically, but the basic argument is the same. For instance, there is a wide body of research using a rational choice framework that considers the "costs" and "benefits" of having children, particularly in the literature about teenage fertility (e.g., Deptula, Henry, Schoeny, and Slavick, 2006; Driscoll, Sugland, Manlove, and Papillo, 2005; Liefbroer, 2005;). Other research positions attitudes toward childbearing as reflective of indifference, ambivalence, antinatalism, or propregnancy/

pronatalism (e.g., Brückner, Martin, and Bearman, 2004; Jaccard, Dodge, and Dittus, 2003; Miller et al. 2013). Reproductive behavior is also closely linked to attitudes about the acceptability of using methods to avoid childbearing (Brückner, Martin, and Bearman, 2004; Ryan, Franzetta, and Manlove, 2007; Sieving, Bearinger, Resnick, Pettingell, and Skay, 2007). Although most research using attitudes to predict reproductive outcomes uses multiple measures of these concepts, few researchers explicitly pay attention to the measurement properties; the few exceptions (Deptula et al., 2006; Miller, 1995) do not consider attitudes toward using (or not using) contraception as part of attitudes toward avoiding pregnancy. As a result, the measures – and interpretation of findings – included in this body of work vary substantially.

We do not include direct measures of fertility intentions or desires (e.g., "on a scale of one to five, how much do you want to get pregnant right now?" or "do you plan to have a child in the next two years?") in our conceptualization of reproductive attitudes; rather, we focus on the more distal determinants of fertility behavior that theoretically have a causal link to intentions and desires. Some theoretical frameworks conceptualize intentions and desires as independent of attitudes (e.g., Fishbein and Ajzen, 2010), while others describe a causal relationship between general attitudes, desires, and specific intentions (Miller, 1994, 1995). Empirically, attitudes toward pregnancy and contraception vary even within women who do not intend to become pregnant, and attitudes have predictive power independent of intentions (Hayford et al., 2016). In the age ranges we study here, intentions to have children are rare, and the large majority of births are unintended. We therefore exclude intentions from our analysis.

We also exclude attitudes toward sex that do not directly reference pregnancy. Although attitudes about sex (such as whether sex is pleasurable, would lead to more respect among peers, or would upset one's parents) predict sexual behavior (Cuffee, Hallfors, and Waller, 2007;

Lemer, Blodgett Salafia, and Benson 2013), differences in sexual behavior play a relatively small part in explaining disparities in early and unintended fertility; instead, variation in contraceptive use is the major driver of these outcomes (Boonstra 2014; Sweeney and Raley, 2014). Additionally, attitudes toward sex are highly gendered, often tapping into – for women – concerns about social stigma and pejorative labeling rather than solely measuring concerns about pregnancy (Kreager and Staff 2009; Lyons, Giordano, Manning, and Longmore 2011; Petersen and Shibley Hyde 2011).

Reproductive knowledge includes knowledge about reproductive biology, knowledge about the existence of different contraceptive methods, and knowledge about the use and effectiveness of different methods, along with confidence in that knowledge. Previous research has demonstrated that reproductive knowledge predicts contraceptive use and pregnancy (Frost, Lindberg, and Finer, 2012; Rocca and Harper, 2012; Ryan, Franzetta, and Manlove, 2007) and that there is substantial variation in levels of reproductive knowledge in the U.S. population, especially among young adults (Frost, Lindberg, and Finer, 2012; Guzzo and Hayford, 2012; Kaye, Suellentrop, and Sloup, 2009; Wynn, Foster, and Trussell, 2009). To date, research has organized measures of reproductive knowledge in different ways. For example, some studies measure knowledge about how to use condoms separately from knowledge about hormonal contraception or the female reproductive cycle (Frost, Lindberg, and Finer, 2012; Ryan, Franzetta, and Manlove 2007), and other scholars consider an individual's level of confidence about the accuracy of knowledge as a separate dimension (Crosby and Yarber, 2001). Some work uses responses to single survey questions rather than group them in any fashion (Borrero, Farkas, Dehlendorf, and Rocca, 2013; Craig et al., 2014). The variability across studies in terms of which measures are analyzed and grouped together – or even included in surveys to begin

with – inhibits identification of the dimensions of reproductive knowledge that are likely most salient for reproductive behaviors. Moreover, there is considerable variability in the results across studies of sexual and reproductive behavior (Brückner, Martin, and Bearman, 2006; Ryan, Franzetta, and Manlove, 2007; Santelli, Lundberg, Abma, McNeely, and Resnick, 2000). Such variability could be attributed not only to differences in the measures used but also to more basic problems such as confusing questions or the use of unfamiliar terms, an issue perhaps especially relevant for teens and young adults. For instance, Hockenberry-Eaton and colleagues (1996) suggest that technical terms like "ovulation" or "ejaculation" are unfamiliar to many adolescents.

Current research

Based on prior work, we propose a multidimensional set of constructs that comprise the social-psychological precursors of reproductive behavior and test this framework by applying it to questions available in two datasets used to study adolescent and young adult fertility, the National Longitudinal Survey of Adolescent to Adult Health (Add Health) and the Relationship Dynamics and Social Life study (RDSL). These two surveys both include a wide range of measures related to reproduction, and the RDSL includes some of the same questions used in Add Health. However, the two surveys were conducted approximately 15 years apart and have different sample frames (see details in the data and methods section below). Thus, the two surveys constitute a useful test for the generalizability of our proposed framework.

We conducted exploratory factor analysis (EFA) to understand the structure of associations between these items and to identify potential latent factors, then tested the models generated through EFA using confirmatory factor analysis (CFA). We used an iterative model-building process guided by existing research and theory as well as model fit statistics to establish a good-fitting model (Brown and Cudeck, 1992; Hu and Bentler, 1996; MacCallum, Brown, and

Sugawara, 1996) describing the latent factors underlying the concepts of reproductive attitudes and reproductive knowledge. In maximizing model fit and guided by our expectations of these two concepts as multidimensional, we placed secondary importance on adhering to other traditional EFA and CFA rules of thumb, such as the minimum number of items to include in a factor or ideal factor loadings (examples of which can be found in Tabachnick and Fidell (2001) or Worthington and Whittaker (2006), among others). This approach reveals the underlying factors that comprise reproductive attitudes and reproductive knowledge but also points to where and how measures that are currently available in surveys may not thoroughly capture the concepts they seemingly are meant to measure. This approach also permits us to identify where caution should be exercised in interpreting results using these measures and to provide insight into where future data collection efforts may need to consider adding or refining existing measures.

Data and methods

Data

We begin with the National Longitudinal Survey of Adolescent to Adult Health (Add Health) (Harris et al., 2009). The target population of Add Health was adolescents in grades 7-12 (ages 12-19) in the United States in 1995. Respondents were re-interviewed in 1996, 2001-2002, and 2007-2008. We use data from the in-home interview of the first wave (n=20,743). Only respondents aged 15 and older were asked questions about sex, reproduction, and contraception, reducing our analytic sample size to 15,072. We further exclude 1,237 respondents with missing values on the weight variables (over-samples of key groups). For the reproductive attitudes questions, 84 respondents were missing responses on all key items (discussed below). The final analytic sample is 13,751 respondents for the reproductive attitudes analyses. For reproductive

knowledge, 171 respondents had missing responses on all key items. The final analytic sample is 13,664 for the reproductive knowledge analyses.

The Relationship Dynamics and Social Life (RDSL) study is a longitudinal survey of attitudes and behavior related to sex, contraception, fertility, and intimate relationships among young women living in a single county in Michigan (Barber, Kusunoki, and Gatny, 2011). The study began in 2008-2009 with an in-person interview using a simple random sample of 1,003 women age 18-19 drawn from the Michigan driver's license and personal identification card database. Respondents were subsequently followed weekly for up to 130 weeks (2.5 years); we use data only from the baseline survey. The response rate for the baseline interview was 84%. For reproductive attitudes, the analytic sample is the full sample of RDSL, but for reproductive knowledge, the analytic sample is 1,002 because one respondent did not provide valid answers to any of the questions (discussed below).

Measures

In Add Health, we searched for relevant survey questions among 39 modules, identifying items from five different modules (pregnancy risk perceptions, attitudes toward birth control, attitudes toward engaging in risky behaviors, reproductive knowledge quiz, and personality and family). Specifically, we found 16 questions that potentially reflect reproductive attitudes and 13 that potentially reflect reproductive knowledge. Reproductive attitudes items were recoded so that higher scores reflect favorable attitudes toward preventing conception (less favorable attitudes toward pregnancy or more favorable attitudes toward birth control). Seven of the reproductive knowledge questions were measured as true or false and recoded so that one indicates the correct answer and zero indicates the incorrect answer. We also included a question indicating the respondent's perception of the risk of pregnancy following a single act of unprotected sex,

measured on a scale 1=almost no chance to 5=almost certain chance. Three of the reproductive knowledge questions (confidence about specific contraceptive methods) were originally on a scale of strongly disagree to strongly agree and were recoded as dichotomous variables where strongly agree and agree are coded together (confident) and neutral, disagree, and strongly disagree coded together (not confident).

Because the RDSL was designed primarily to measure attitudes and behavior related to sex, contraception, and pregnancy, it contains a wider range of measures of attitudes than Add Health. We identified the items most closely related to the core concept of attitudes toward preventing pregnancy and using contraception (and which corresponded as closely as possible to the Add Health measures) – namely, perceived risk of pregnancy, expected personal consequences of pregnancy, attitudes toward early childbearing, and attitudes toward contraception, a total of 25 questions. Responses were recoded so that negative attitudes toward pregnancy and positive attitudes toward contraception had the highest values. In the original RDSL dataset, neutral response options (e.g., neither agree nor disagree) were not provided but were available for respondents who volunteered them. We recoded neutral responses as the mid-point.[1] To measure reproductive knowledge, we used eight true-false items measuring knowledge about pregnancy and the menstrual cycle, condom use, and hormonal contraception. Responses were recoded to one for a correct answer and zero for an incorrect answer. Additionally, a question from Add Health assessing the respondent's perception of the risk of pregnancy following a single act of unprotected sex ("sex once") was repeated in RDSL, but

[1] We conducted sensitivity tests to see whether this approach to handling neutral responses affected results. Specifically, we recoded the "neutral" category in both surveys to missing and re-ran the EFA and CFA. There was very slight decrease in overall goodness of fit for the reproductive attitudes factor structure in RDSL but fit statistics remained within the acceptable range. There was virtually no change in fit in Add Health. In addition, the pattern of factor loadings remained the same, and the significance of all the factor loadings remained the same.

with continuous response options ranging from 1-100; we recoded responses into quintiles to make it comparable to Add Health (1 = almost no chance to 5 = almost certain chance).

Tables 1 and 2 list the wording and variable names of the reproductive attitudes and reproductive knowledge questions, respectively, for both Add Health and RDSL; Add Health estimates are weighted to account for the survey design (Chantala, 2001), but RDSL are not weighted, as RDSL used a simple random sample and does not require weighting. Table 1 also shows means and standard deviations for the scaled measures that potentially indicate reproductive attitudes. For the potential reproductive knowledge items, Table 2 indicates the correct answer in parentheses for the true/false items, along with the proportion answering correctly, as well as the proportion answering strongly agree/agree for the confidence items, and the mean and standard deviation for the perception of pregnancy risk from unprotected sex item.

- Table 1 here –

- Table 2 here -

Analytic approach

Variables were coded in Stata 13, and all EFA and CFA analyses were run using *Mplus* 7. Factor analyses using Add Health data were weighted. We used both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) (Devellis, 2012) to identify underlying factors. Because many of the items are binary or categorical, the analyses used robust weighted least squares, an estimator which does not assume a normal distribution (Brown, 2006).

We conducted an EFA with maximum likelihood estimation with standard errors and oblique rotation, which allows the factors to be correlated. We compared the fit of models with different numbers of items and factors using two goodness-of-fit criteria, Root Mean Squared Error of Approximation (RSMEA) and Comparative Fit Index (CFI), and we conducted a chi-

square test of model fit to determine significant differences in the improvement of model fit across models (Hu and Bentler, 1999). RSMEA values of .01, .05, and .08 are indicators of excellent, good, and mediocre fit, respectively (Brown and Cudeck, 1992; MacCallum. Brown and Sugawara, 1996). In this analysis, we used a cutoff of .05 or lower to indicate a good-fitting model. The CFI ranges from 0 (poor fit) to 1 (perfect fit), and values of a .90 or higher provide evidence for adequate model fit, with scores about .95 indicating an excellent fitting model (Hu and Bentler, 1999).

EFA is, in essence, a method that simplifies numerous measures that are likely interrelated but does not require an *a priori* expectation of the number of latent factors or of which items load on a particular factor. In EFA, all items load on all latent factors rather than on pre-determined factors, and multiple models with different numbers of latent factors are explored. The multiple EFA results are used to determine how many latent factors are sufficient to account for the covariance of these items. After the number of latent factors is determined by comparing model fit statistics across models with different numbers of latent factors, researchers then identify items that are highly associated with each of these factors, guided by the size and magnitude of factor loadings as well as theory. Thus, while EFA starts with all items loading on all latent factors, it eventually leads to a more parsimonious factorial structure in which each of latent factors is defined and measured by different items.

We then used confirmatory factor analysis (CFA) to confirm the parsimonious model identified in the EFA. CFA requires a more restrictive set of assumptions and is designed to test whether the hypothesized factorial structure from EFA is supported within the data. Although CFA uses the same goodness of fit statistics and criteria, the underlying calculations are different because the number of factors and which items load on to which factor are specified by the

researcher. We often found that a factorial structure deemed good in EFA was not acceptable in the CFA. We then examined which factors and items seemed problematic in the CFA and returned to the EFA. As such, model identification was an iterative process in which we moved back and forth testing models in EFA and CFA, beginning with all potential items and then removing items and adjusting the number of factors as necessary to achieve the best-fitting model in the CFA. As noted above, maximizing model fit (thresholds as noted above) and consistency with prior research and theory were the guiding principles, with less weight applied to other standards for factor analysis.

Widely used rules of thumb are that there should be at least three items in a factor and that EFA factor loadings should be statistically significant and at least 0.3 or higher (Grice, 2001; Tabachnick and Fidell, 2001; Worthington and Whittaker 2006). However, we did not strictly adhere to these rules of thumb. Low factor loadings or latent factors with only two measures can point to how existing measures are insufficient to fully capture the factor; understanding these weaknesses in existing measures is one of our goals in this analysis. Although higher factor loadings suggest that a particular measure strongly indicates the underlying factor, the primary concern in CFA is that all factor loadings are significantly different from zero; low loadings do not take away from the validity of a factor itself.

One concern is that the shared wording of many of the items could lead to similar responses due to question wording rather than due to content ("method effects"). To address this possibility, we tested for correlated residuals among similarly worded questions in the final model identified in the CFA, setting the factor variance to one to allow all of the factor loadings to be freely estimated. Using the Santorra-Bentler scaled chi-square difference test, we identified which items (if any) had significant correlations and then added the correlations to the models

when necessary. Only the reproductive attitudes models had any significant method effects, and accounting for correlated residuals did not change the fit or the factorial structure.

We begin by presenting the results for reproductive attitudes. We first analyzed the Add Health data, because it is one of the most widely used surveys of teen sexual behavior and includes a large and diverse sample, and then replicated the results with RDSL. We followed the iterative process described in the preceding paragraph for both datasets, as there were substantially more items in RDSL than in Add Health, and we present the results for both the EFA and CFA for both datasets. Next, we present the results for reproductive knowledge, again beginning with Add Health. Here, because there was substantial overlap across surveys (of the eight items in RDSL, seven were identical to those in Add Health, with only one new variable), we were able to proceed directly to CFA in RDSL guided by the model identified in the Add Health analysis. As such, we present the EFA results for Add Health only but have CFA results for both Add Health and RDSL.

Results for reproductive attitudes

Add Health factor analyses

For reproductive attitudes, we applied the iterative EFA-CFA process described above to Add Health to identify measures and determine what factor or factors they indicated. In this process, we identified four measures ("preg abortion," "preg marry wrong," "BC easy to get," and "BC looking for sex") that did not fit into any factorial structure. We then tested equivalent 1-, 2-, 3-, and 4-factor models using the remaining measures and determined that a 3-factor model fit the data best (see Table 3), with twelve reproductive attitudes questions measuring three latent factors in Add Health. The EFA factor loadings from the factorial pattern that produced the best-fitting model in both the EFA and CFA are shown in Table 4. We determined that two measures

("preg worst," and "preg not bad") loaded on the first factor, six measures ("BC morally wrong," "BC bother," "BC hard partner," "BC planning," "BC less pleasure," and "BC expensive") loaded on the second factor, and four measures ("preg too fast," "preg quit school," "preg embarrass family," and "preg embarrass self") loaded on the third factor.

- Table 3 here -

- Table 4 here -

The final and best-fitting model from CFA is depicted in Figure 1. The CFA confirmed that this 3-factor model had very good model fit (CFI = 0.982, RSMEA = 0.024), and both the loadings and covariances of these factors were all significantly different from zero. Therefore, the CFA confirms that in the Add Health data, the correlations among the twelve measures of reproductive attitudes are adequately explained by three factors. Each of these factors is measured by a unique set of questions, and these factors appear to represent three logical sub-dimensions of reproductive attitudes.

- Figure 1 here -

The first factor, which we term *feelings toward pregnancy,* assesses how respondents feel about a hypothetical pregnancy. The second factor, which we term *birth control attitudes,* represents the respondent's overall orientation towards contraception, which we interpret as how difficult or "costly" (on a social and relational basis) it is to take steps to avoid pregnancy. The final factor, which we term *life course consequences,* measures how a hypothetical pregnancy, and specifically a pregnancy at this age, would impact particular aspects of the respondent's life. Note that the first factor has only two items, "preg worst" and "not bad." The general rule is that a factor should have at least three items, but Worthington and Whittaker (2006) note that it is possible to keep a factor with only two items if the items are highly correlated ($r > .70$) with each

other, relatively uncorrelated with other items, and have substantive meaning. These two items are moderately correlated at $r = .62$ (the highest correlation between any two items among the full set of variables, in fact) and are only weakly correlated with other items. Despite the modest correlation, we chose to retain this factor for substantive reasons linked to the findings for the RDSL data, which we discuss below. Additionally, these two items have indeed been used together as a scale in prior work with Add Health to predict fertility (Jaccard, Dittus, & Dodge, 2003; Garfield et al., 2016).

Replication with RDSL

As seen in Table 1, there were substantially more potential items in RDSL for reproductive motivations than in Add Health. As such, it was unclear whether and how the additional items would fit into the pattern established in Add Health. We therefore used the same iterative EFA-CFA process described above to identify factors and measures. In doing so, we removed five questions ("BC sick," "preg family help," "condom mistrust," "BC afford," "BC easy to get") that did not fit in any factorial structure. We then examined fit across models with successively more factors and determined that a 5-factor model fit the RDSL data best and that the remaining 20 reproductive attitudes measures indicated five latent factors (see Table 3). Based on the magnitudes of EFA factor loadings for each of the measures (Table 5) for the best-fitting model, four measures ("preg worst," "preg not bad," "baby less lonely," and "preg partner happy") loaded on the first factor, six measures ("BC morally wrong," "BC hassle," "BC looking for sex," "BC planning," "BC less pleasure," and "BC expensive") loaded on the second factor, four measures ("preg grow up too fast," "preg quit school," "preg handle parenting," and "preg afford") loaded on the third factor, three measures ("young grandparents," "young recover," and

"young lose weight") loaded on the fourth factor, and three measures ("wait perfect time," "hard old parents," "older mom, baby problems") loaded on the fifth factor.

- Table 5 here -

The final CFA model for RDSL is shown in Figure 2. The CFA revealed that the 5-factor model had adequate fit (CFI = 0.953, RSMEA = 0.030), and the loadings on these factors were all significantly different from zero. In addition, the covariances among these five factors were all significantly different from zero, with one exception – the correlation between the third and fifth factors was not significant. As part of the iterative process above, we explored models with both fewer and more factors and considered whether measures indicated different factors, but no other factor structure provided acceptable fit. As such, given the acceptable overall fit of this 5-factor model, the significant factor loadings, and the significant covariances (correlations) between these two particular factors and the three remaining factors, we conclude that there are five distinct sub-dimensions measured by unique sets of questions that comprise the larger concept of reproductive motivations.

- Figure 2 here -

Three of the factors identified in RDSL seem to parallel the three factors identified in Add Health: *feelings toward pregnancy*, *birth control attitudes*, and *life course consequences*. The *feelings toward pregnancy* factor in RDSL has two of the same questions ("preg worst" and "preg not bad") and two questions that are unavailable in Add Health ("baby less lonely" and "preg partner happy"). Like the other items, these questions measure feelings about a potential pregnancy, in this case related to predicted relationships between the respondent and a child and between the respondent and her partner. This last item ("preg partner happy") reflects the woman's perception about her partner's reaction; its inclusion is consistent with other work

demonstrating that women's own feelings about pregnancy are strongly related to the anticipated reaction or support from a partner (Aiken and Trussell, 2017; Miller, Barber, and Schulz, 2017). *Birth control attitudes* was largely similar across the two datasets, with five of the six overlapping. The measure "BC hard partner" was not available in RDSL, and the measure "BC looking for sex" loaded on this factor in RDSL but not in Add Health. The latter discrepancy may also be driven by slight differences in question wording, with the RDSL question more generally referring to how women who use birth control are perceived but the Add Health question specifically referring to how the respondent might be perceived by his or her friends. Two of the measures in the *life course consequences* factor were identical for both RDSL and Add Health, while the other two measures in the factor for each dataset were not available in the other dataset. The two additional RDSL factors use measures not available in Add Health. The first of these factors, which we term *advantages of early fertility,* describes respondents' views of how being a young parent can potentially be beneficial. The second factor, which we term *disadvantages of delayed fertility,* represents respondents' perceptions of the problems that may occur if they delay having children. We did a sensitivity test to ensure that the acceptability of the full factorial pattern was not due to the additional two factors by excluding these items and re-running the CFA. Model fit remained high in a model including only the first three factors (RMSEA = .030 and CFI = .972; not shown in tables).

Results for reproductive knowledge

Add Health factor analyses

We repeated the process to understand the dimensional structure of reproductive knowledge, beginning again with Add Health. Through the iterative process, we removed measures identified as contributing to unacceptable model fit because they did not fit into any factorial structure.

Four measures ("pull out," "sex once," "sperm die," and "ovulate") were removed at this stage. With the remaining measures, we tested equivalent 1-, 2-, 3-, and 4-factor models using a chi-square difference test to determine improvement of model fit as a result of each additional factor (see Table 3) and found that a 3-factor model fit the data best (derived from x^2 difference tests p <.001). Based on the final EFA factor structure (Table 6), two measures ("before period" and "during period") loaded on the first factor, four measures ("withdraw, get preg," "fit tight," "vaseline," and "fully unroll") loaded on the second factor, and three measures ("rhythm confidence," "condom confidence," and "withdrawal confidence") loaded on the third factor.

- Table 6 here -

Next, we present the CFA of the final 3-factor model found in the Add Health reproductive knowledge analysis (Figure 3). The CFA revealed that the 3-factor model had very good fit (CFI = 0.981, RSMEA = 0.015). In addition, the factor loadings and covariances were all significantly different from 0. Given this, the CFA confirms that in the Add Health data, the nine measures of reproductive knowledge can be adequately explained by three factors. Each of these factors is measured by a unique set of questions, and the factors represent three logical sub-dimensions of reproductive knowledge.

- Figure 3 here -

The first factor, which we term *female reproductive biology knowledge,* represents respondents' knowledge of the physiological aspects of female reproduction. The second factor, which we term *condom knowledge,* describes the respondent's overall knowledge of condoms and how to use them effectively. The final factor, which we term *birth control confidence,* identifies how confident individuals feel about their general knowledge of some specific contraceptive methods. All factor loadings are significant at p<.001, and all factors were

positively and significantly correlated with each other, indicating that there are three inter-related factors that reflect reproductive knowledge. Again, though, we have a factor (*female reproductive biology knowledge)* with only two measures. The correlation between them is quite low ($r = 0.15$), suggesting that they do a fairly poor job of measuring this latent factor. We retain this factor primarily because of the overall strong model fit and because of the results from the RDSL replication below, but we return to the substantive implications of this poor measurement in the discussion. We also ran a sensitivity test excluding the *birth control confidence* factor, as such items are not available in RDSL, and the model fit remains high (RMSEA = .011, CFI = .978; not shown in tables).

Replication with RDSL

As evident in Table 2, the RDSL data contain several measures identical to those found in the Add Health data, with one additional item ("miss pills"); RDSL does not contain any measures of confidence. Given the similarity, we proceeded directly to CFA with RDSL data to replicate the reproductive knowledge model found in Add Health (as such, there are no EFA fit statistics or factor loadings for RDSL reproductive knowledge). Essentially, we tested whether the RDSL measures represent the same two latent factors (the model above minus *birth control confidence*) we identified in Add Health. We tested additional models with the extra measure, "miss pills," loading on each factor and found that it loaded significantly on *female reproductive biology knowledge* but not on *condom knowledge*. The final model therefore includes "miss pills" in the first factor plus the two questions about the most likely time for a woman to get pregnant. As with the Add Health models, "pull out" did not load significantly with any factor, so we excluded it from the model. As seen in Figure 4, the same factorial pattern (excluding the *birth control confidence* factor) was indeed found in RDSL with very good model fit (CFI = 0.943, RSMEA =

0.027). In sum, these models provided additional evidence that there are multiple underlying factors indicating reproductive knowledge and that knowledge about female reproductive biology and about the use of condoms constitute distinct domains.

- Figure 4 here -

Discussion

Levels of unintended fertility, particularly among teens and young adults, remain high in the United States, and, despite substantial study, the underlying reasons for the persistence of unintended fertility are not well understood. In particular, although a large body of research confirms that attitudes and knowledge predict fertility (e.g., Brückner, Martin, & Bearman, 2004; Deptula, Henry, Schoeny, & Slavick, 2006; Garfield et al., 2016; Hayford & Guzzo, 2013; Jaccard, Dodge, & Dittus, 2003; Ryan, Franzetta, & Manlove, 2007; Shneyderman & Schwartz, 2013), there has been little effort to synthesize findings across existing studies. We drew from this work to organize measures of attitudes and knowledge about pregnancy and contraception into two key concepts, *reproductive attitudes* and *reproductive knowledge*.

We used psychometric techniques to conduct a systematic and rigorous analysis of a wide range of survey questions related to attitudes toward preventing reproduction and knowledge of the reproductive process using data from two different surveys of adolescents and young adults. Using data from Wave I of the Add Health, a nationally-representative sample of adolescents conducted in 1995, and data from RDSL, a population-based survey of 18-19 year old women in a county in Michigan conducted in 2008-2009, we showed that reproductive attitudes and reproductive knowledge are each multidimensional concepts that can be identified using existing survey measures. Specifically, in both surveys, measurement models for reproductive attitudes identify latent factors representing *feelings toward pregnancy*, *birth control attitudes*, and *life*

course consequences of pregnancy. In the RDSL dataset, additional measures related to early childbearing represent two additional unique factors: *advantages of early fertility* and *disadvantages of delayed fertility*. Measurement models for reproductive knowledge in both surveys suggest separate latent factors corresponding to distinctly gendered realms of reproduction: *female reproductive biology knowledge* and *condom knowledge*. In the Add Health dataset, which also asked young people how confident they were about their knowledge, levels of *birth control confidence* identify a unique factor.

Our application of psychometric techniques was guided by social-psychological theory and overall model fit. While we indeed identified multiple underlying factors within the concepts of reproductive attitudes and reproductive knowledge, the low factor loadings or few items within some factors suggest that existing items and datasets have not fully or sufficiently measured these concepts. Thus, an equally important implication of our analyses is what is lacking or problematic with the measurement of reproductive attitudes and knowledge in surveys to date. For instance, although both logic and theory would lead to predictions that knowledge of female reproductive biology – ovulation, the menstrual cycle, fertile periods, and the like – is key for understanding the risks of pregnancy, the measures in Add Health seem insufficient to adequately represent this factor, as only two measures loaded on the factor. In both Add Health and RDSL, the question about the regularity of women's periods did not fit into this factor. This finding is unexpected but may be because the question ("most women's periods are regular, that is, they ovulate or are fertile fourteen days after their periods begin") is poorly worded. This question conflates "regular" cycles with cycle length, yet women can have longer or shorter cycles that are regular (and many teens have not yet developed regular cycles (Adams Hillard, 2014)). It also uses the term "ovulate," which prior work has shown to be unfamiliar to many

adolescents (Hockenberry-Eaton et al., 1996). Similarly, in neither survey did the question about the risk of pregnancy following a single incident of unprotected sex load onto any of the reproductive knowledge factors. In our opinion, this is likely because there is not, in fact, a good answer to the question, as the risk is highly dependent upon the timing of sex relative to the menstrual cycle; for this reason, reproductive health experts typically discuss the risk of pregnancy over an extended period of time among those having regular unprotected sex (e.g., Trussell, 2011).

Still, the overall similarity of the measurement structures we identified is remarkable, given that the two datasets used in this analysis have different samples, were collected at different times, and include different survey measures (although with substantial overlap). These findings should encourage researchers to use a similar measurement structure when analyzing other datasets and to design future surveys with measures that assess similar structures. Further, the results suggest that because specific questions in different surveys seem to represent similar underlying concepts, it should be possible to make comparisons across datasets and align findings using different measures. Doing so would allow the field to build a more cohesive understanding of the knowledge and attitudes that precede sex, contraceptive use, and fertility.

Limitations

This article focused on how to analyze and interpret measures found in existing datasets. We were thus limited, by design, to these existing survey questions. It is likely that there are other dimensions of both reproductive attitudes and reproductive knowledge not captured by these surveys. Even for questions that were included in the surveys, our findings may be specific to specific question wordings or sample characteristics. Other measures or samples might provide different results. For example, the National Survey of Family Growth (NSFG) includes a

question, “If you got pregnant now, how would you feel?” with the response categories, “very upset, a little upset, a little pleased, or very pleased.” This question may be an indicator for the latent reproductive attitudes factor *feelings toward pregnancy* found in Add Health and RDSL. But the question is worded differently, and the response options are different, in the NSFG.

Another limitation is that although the TPB and other related theories explicitly recognize the role of normative influences (Philipov et al., 2009), we did not include items reflecting the respondents’ perceptions of peer context because such measures were unavailable in Add Health, and we had limited measures of the respondents’ perceptions of family and partner context. Qualitative work about the role of social norms (Bernardi, 2003; Bute and Jensen, 2010; Mollborn and Sennott, 2015) and quantitative work linking the reproductive behavior of others at both the micro (Balbo and Barban, 2014) and macro (Brewster, Billy, and Grady, 1993) level suggest that surveys need to incorporate questions capturing perceptions of the social context of reproduction.

Conclusions

Our primary goal was to apply psychometric methods for guidance in how to use existing datasets and commonly used measures of reproductive attitudes and knowledge and how to interpret existing research using these data. This parallel analysis of two datasets provides some guidance about how to conceptualize these measures. The consistency of our findings suggests that the latent factors we identify are generalizable, at least among adolescents and young adults in the United States, and can be used as orienting concepts both in developing measures and in examining the determinants of unintended pregnancy and other fertility outcomes. For example, future research on the relationship between attitudes and fertility might distinguish between *feelings toward pregnancy* and *life course consequences* in selecting which attitudinal measures

to include in analyses. Future work on reproductive knowledge, which would no doubt include items about both reproductive physiology and contraceptive knowledge, might wish to incorporate confidence indicators; it is possible for someone to have inaccurate knowledge but high levels of confidence, for instance.

Our findings constitute a first step in understanding how various measures of attitudes and knowledge reflect broader concepts linked to sexual and reproductive health. Additional analysis is necessary in order to determine the robustness of the factorial structure we describe. For example, future studies should analyze the degree to which this measurement structure is invariant across subgroups (e.g., race-ethnic groups, genders, sexual minorities), how it may change with age and fertility behaviors (as many of the items here are quite specific to adolescence and young adulthood), and the degree to which it holds in other datasets with different combinations of survey questions. And certainly, future research is needed to explore how these measures are connected to key outcomes such as sex, contraception, and pregnancy. It is possible that these underlying factors relate to key outcomes differently; it is possible that *birth control attitudes* would be more strongly related to contraceptive use whereas *life course consequences* would be more strongly related to decisions about carrying a pregnancy to term. Further, these factors may be related to outcomes in varying ways across age, gender, or other characteristics; women's *female reproductive biology knowledge* may more strongly link to their own sexual behavior than it does for men. To the extent that this framework is useful in understanding the determinants of sex, contraception, and pregnancy, it could also be used to guide policy and practice. For instance, identifying the dimensions of reproductive knowledge that are most closely linked to behavior could highlight areas to be addressed in education efforts or clinical practice.

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Table 1. Potential Reproductive Attitudes Measures in Add Health (Weighted) and RDSL[A]

	Variable name	Add Health Mean (SD)	RDSL Mean (SD)
Using birth control is morally wrong.	*BC morally wrong*	4.14 (1.04)	4.27 (0.72)
If a woman waits for the perfect time to have a baby, she will probably have trouble getting pregnant.	*wait perfect time*		3.57 (0.95)
Getting pregnant at this time in your life is one of the worst things that could happen to you.	*preg worst thing*	4.32 (1.00)	3.88 (1.26)
It wouldn't be all that bad if you got pregnant now.	*preg not bad*	4.21 (1.00)	3.80 (1.10)
If you had a baby now, you would feel less lonely.	*baby less lonely*		3.94 (0.88)
If you got pregnant now, you could handle the responsibilities of parenting.	*preg handle parenting*		3.20 (1.33)
If you got pregnant, you would be forced to grow up too fast.	*preg grow up fast*	3.85 (1.15)	3.23 (1.22)
It is easy for you to get birth control	*BC easy to get*	3.63 (1.22)	4.03 (0.84)
If you got pregnant, you would have to quit school.	*preg quit school*	2.39 (1.16)	2.31 (1.03)
If you got pregnant now, your partner would be happy.	*preg partner happy*		3.50 (1.77)
If you got pregnant now, could not afford to raise the child.	*preg not afford*		3.40 (1.22)
In general, birth control is too much of a hassle to use.	*BC hassle*	4.04 (1.15)	4.22 (0.84)
It takes too much planning ahead of time to have birth control on hand when you're going to have sex.	*BC planning*	3.93 (1.10)	4.18 (0.62)
Birth control interferes with enjoyment.	*BC less pleasure*	3.76 (1.14)	4.11 (0.65)
In general, birth control is too expensive to buy.	*BC expensive*	3.89 (1.08)	3.90 (0.87)
If you got pregnant now, your family would help you raise the child.	*preg fam help*		2.03 (0.92)
If a woman asks her partner to use a condom, he will think that she doesn't trust him.	*condom mistrust*		3.75 (1.22)
It is better to have kids young because the grandparents can be more involved.	*young grandparents*		3.60 (1.14)
It is better to get pregnant young because young women's bodies recover faster.	*young recover*		3.81 (1.02)
It is easier for young women to lose weight after a pregnancy.	*young lose weight*		3.23 (1.11)
It is hard for kids to have the oldest parents at their school.	*hard old parents*		3.63 (0.99)
Using birth control is likely to make a woman feel sick.	*BC sick*		3.36 (1.05)
Babies born to older mothers have more health problems.	*older mom, baby problems*		3.19 (1.04)
If a girl uses birth control, she is looking for sex.[B]	*BC looking for sex*	3.52 (1.19)	4.07 (0.77)
You can't afford to pay for birth control.	*BC can't afford*		3.92 (0.89)

If you got (If R is male, add: someone) pregnant, it would be embarrassing for your family.	*preg embarrass family*	3.63 (1.29)
If you got pregnant (If R is male, add: someone), it would be embarrassing for you.	*preg embarress self*	3.62 (1.36)
If you got pregnant, you would have to decide whether or not to have the baby, and that would be stressful and difficult.	*preg abortion*	3.84 (1.26)
If you got pregnant, you might marry the wrong person, just to get married	*preg marry wrong*	3.18 (1.31)
It {IS/WOULD BE} too hard to get a {GIRL/BOY} to use birth control with you.	*BC hard partner*	3.87 (1.07)

[A] In Add Health, unless otherwise indicated, all items measured on a scale of 1=strongly agree to 5=strongly disagree, with 3=neither agree not disagree. In RDSL, unless otherwise indicated, all items measured on a scale of 1=strongly disagree, with no neutral response offered but recorded when insisted upon by respondents. RDSL responses were recoded to correspond with Add Health. Analytically, items were reverse coded as necessary such that higher responses means less favorable attitudes toward childbearing and more favorable attitudes toward contraception.

[B] In Add Health, this question was worded: "If you used birth control, your friends might think that you were looking for sex."

Table 2. Potential Reproductive Knowledge Measures and Distributions in Add Health (Weighted) and RDSL

	Variable name	Add Health	RDSL
True/False questions[A] *- proportion answering correctly*			
Most women's periods are regular, that is, they ovulate or are fertile fourteen days after their periods begin. (false)	ovulate	27.2%	21.5%
The most likely time for a woman to get pregnant is right before her period starts. (false)	before period	42.4%	41.7%
In general, a woman is most likely to get pregnant if she has sex during her period, as compared with other times of the month. (false)	during period	60.4%	68.9%
When a women has sexual intercourse, almost all sperm die inside her body after about six hours. (false)	sperm die	59.8%	
Even if the man pulls out before he ejaculates, even if ejaculation occurs outside of the woman's body, it is still possible for the woman to become pregnant. (true)	withdraw, get preg	80.5%	81.8%
When putting on a condom, it is important to have it fit tightly, leaving no space at the tip. (false)	fit tight	57.0%	63.1%
Vaseline can be used with condoms, and they work just as well. (false)	vaseline	68.5%	
As long as the condom fits over the tip of the penis, it doesn't matter how far down it is unrolled. (false)	fully unroll	89.2%	96.0%
When using a condom, the man should pull out of the woman right after he has ejaculated. (false)	pull out	74.4%	70.8%
When a woman misses more than two days of birth control pills, she should use another birth control method. (true)	miss pills		70.5%
If you were to have sexual intercourse once or twice without using birth control, what are the chances that you would get pregnant? [B]	sex once	3.21(0.97)	3.30(1.23)
Confidence questions[C] *- proportion answering strongly agree/agree*			
You are quite knowledgeable about the rhythm method of birth control and when it is a "safe" time during the month for a woman to have sex and not get pregnant.	rhythm confidence	57.8%	
You are quite knowledgeable about how to use a condom correctly.	condom confidence	89.0%	
You are quite knowledgeable about the withdrawal method of birth control. [B]	withdrawal confidence	70.1%	

[A] Analytically, items were recoded so that 1 equals the correct answer, and 0 equals the incorrect answer.

[B] In Add Health, this item was measured on a scale of 1=almost not chance to 5=almost certain, In RDSL, this item was measured on a scale of 1-100%, which we recoded to correspond with Add Health.

[C] Originally measured on a scale of 1=strongly agree to 5=strongly disagree. Recoded as a dichotomous variable: 1=strongly agree/agree and 0=all other responses.

Table 3. Comparing Model Fit across Exploratory Factor Analysis (EFA) Models

	DF	CFI	RMSEA	Chi-Square Test of Model Fit	Chi-Square Test for Difference Testing
Reproductive Attitudes: Add Health					
One-Factor Model	54	0.529	0.116	10034.611	---
Two-Factor Model	43	0.941	0.046	1293.568	p = .000[1]
Three-Factor Model	**33**	**0.992**	**0.019**	**202.632**	**p = .000[2]**
Four-Factor Model	Produced single-item factors				
Reproductive Attitudes: RDSL					
One-Factor Model	170	0.562	0.099	1857.970	---
Two-Factor Model	151	0.839	0.064	770.604	p = .000[1]
Three-Factor Model	133	0.942	0.041	354.476	p = .000[2]
Four-Factor Model	116	0.963	0.035	258.866	p = .000[3]
Five-Factor Model	**100**	**0.978**	**0.029**	**185.206**	**p = .000[4]**
Six-Factor Model	Produced single-item factors				
Reproductive Knowledge: Add Health					
One-Factor Model	27	0.818	0.044	727.213	---
Two-Factor Model	19	0.971	0.021	131.544	p = .000[1]
Three-Factor Model	**12**	**0.997**	**0.008**	**21.971**	**p = .000[2]**
Four-Factor Model	6	1.000	0.000	3.716	p= .745[5]

[1] Significant differences between one-factor and two-factor model
[2] Significant differences between two-factor and three-factor model
[3] Significant differences between three-factor and four-factor model
[4] Significant differences between four-factor and five-factor model
[5] Not significant improvement in model fit

Table 4. Factor Loadings from Exploratory Factor Analysis (EFA) for Three-Factor Model of Reproductive Attitudes in Add Health

Factor 1	1	2	3
Getting (If R is male, add: someone) pregnant at this time in your life is one of the worst things that could happen to you.[RC] (*preg worst*)	0.812*	-0.090*	-0.005
It wouldn't be all that bad if you got (IF R is male, add: someone) pregnant at this time in your life. *(preg not bad)*	0.648*	0.013*	0.086*
Factor 2			
Using birth control is morally wrong.[RC] *(BC morally wrong)*	0.011	0.514*	-0.045*
In general, birth control is too much of a hassle to use.[RC] *(BC hassle)*	0.03	0.684*	0.033
It takes too much planning ahead of time to have birth control on hand when you're going to have sex.[RC] *(BC planning)*	-0.015	0.796*	0.011
It {IS/WOULD BE} too hard to get a {GIRL/BOY} to use birth control with you. *(BC hard partner)*	-0.049*	0.683*	-0.003
For you, using birth control {interferes/would interfere} with sexual enjoyment.[RC] *(BC less pleasure)*	0.009	0.646*	-0.002
In general, birth control is too expensive to buy.[RC] *(BC expensive)*	0.005	0.683*	-0.022
Factor 3			
If you got (If R is male, add: someone) pregnant, you would be forced to grow up too fast. *(preg grow up fast)*	0.018	-0.138*	0.332*
If you got (If R is male, add: someone) pregnant, you would have to quit school. *(preg quit school)*	0.181*	0.017	0.330*
If you got (If R is male, add: someone) pregnant, it would be embarrassing for your family. *(preg embarrass family)*	-0.075*	-0.011	0.890*
If you got pregnant (If R is male, add: someone), it would be embarrassing for you. *(preg embarrass self)*	0.020*	0.013	0.886*

*$p < .05$

Table 5. Factor Loadings from Exploratory Factor Analysis (EFA) for Five-Factor Model of Reproductive Attitudes in RDSL

Factor 1	1	2	3	4	5
Getting pregnant at this time is one of worst things that could happen. (*preg worst*)	0.553*	-0.027	0.166	0.07	-0.06
Wouldn't be all that bad if got pregnant now. (*preg not bad*)	0.792*	-0.018	0.039	0.011	0.019
If you had a baby now, you would feel less lonely. (*baby less lonely*)	0.333*	0.136*	-0.029	0.100*	0.015
If you got pregnant now, your partner would be happy. *(preg partner happy)*	0.416*	0.109*	0.190*	-0.061	0.029
Factor 2					
Using birth control is morally wrong. *(BC moral)*	-0.04	0.676*	0.032	0.057	-0.121*
Too much of a hassle to use birth control. *(BC hassle)*	0.023	0.590*	0.031	0.029	0.015
It takes too much planning ahead of time to have birth control on hand when you're going to have sex. *(BC planning)*	0.125	0.638*	-0.041	-0.057	0.069
Birth control interferes with enjoyment. *(BC less pleasure)*	-0.072	0.416*	0.042	0.091*	0.005
In general, birth control is too expensive to buy. *(BC expensive)*	0.065	0.404*	-0.083	0.087*	-0.062
If a girl uses birth control, she is looking for sex. *(BC looking for sex)*	-0.036	0.535*	0.013	-0.074	0.101
Factor 3					
If you got pregnant now, you could handle the responsibilities of parenting. (*preg handle parenting*)	0.019	-0.006	0.750*	0.098*	0.018
If pregnant now, would have to grow up too fast. *(preg grow up fast)*	0.115	-0.001	0.506*	-0.035	0.006
If pregnant now, would have to quit school. *(preg quit school)*	-0.032	-0.128*	0.448*	0.016	-0.045
If you got pregnant now, could not afford to raise the child. *(preg not afford)*	0.088	0.062*	0.622*	-0.052	-0.002
Factor 4					
It is better to have kids young because the grandparents can be more involved. *(young grandparents)*	0.032	-0.004	0.038	0.707*	-0.013
It is better to get pregnant young because young women's bodies recover faster. *(young recover)*	0.014	0.019	-0.046	0.713*	0.074
It is easier for young women to lose weight after a pregnancy. *(young lose weight)*	-0.116	0.056	0.061	0.242*	0.094
Factor 5					
If a woman waits for the perfect time to have a baby, she will probably have trouble getting pregnant. *(wait perfect time)*	0.047	0.018	0.08	0.041	0.445*
It is hard for kids to have the oldest parents at their school. *(hard old parents)*	-0.019	0.029	-0.028	0.028	0.570*
Babies born to older mothers have more health problems. *(older mom, baby problems)*	-0.017	-0.076	-0.018	0.045	0.324*

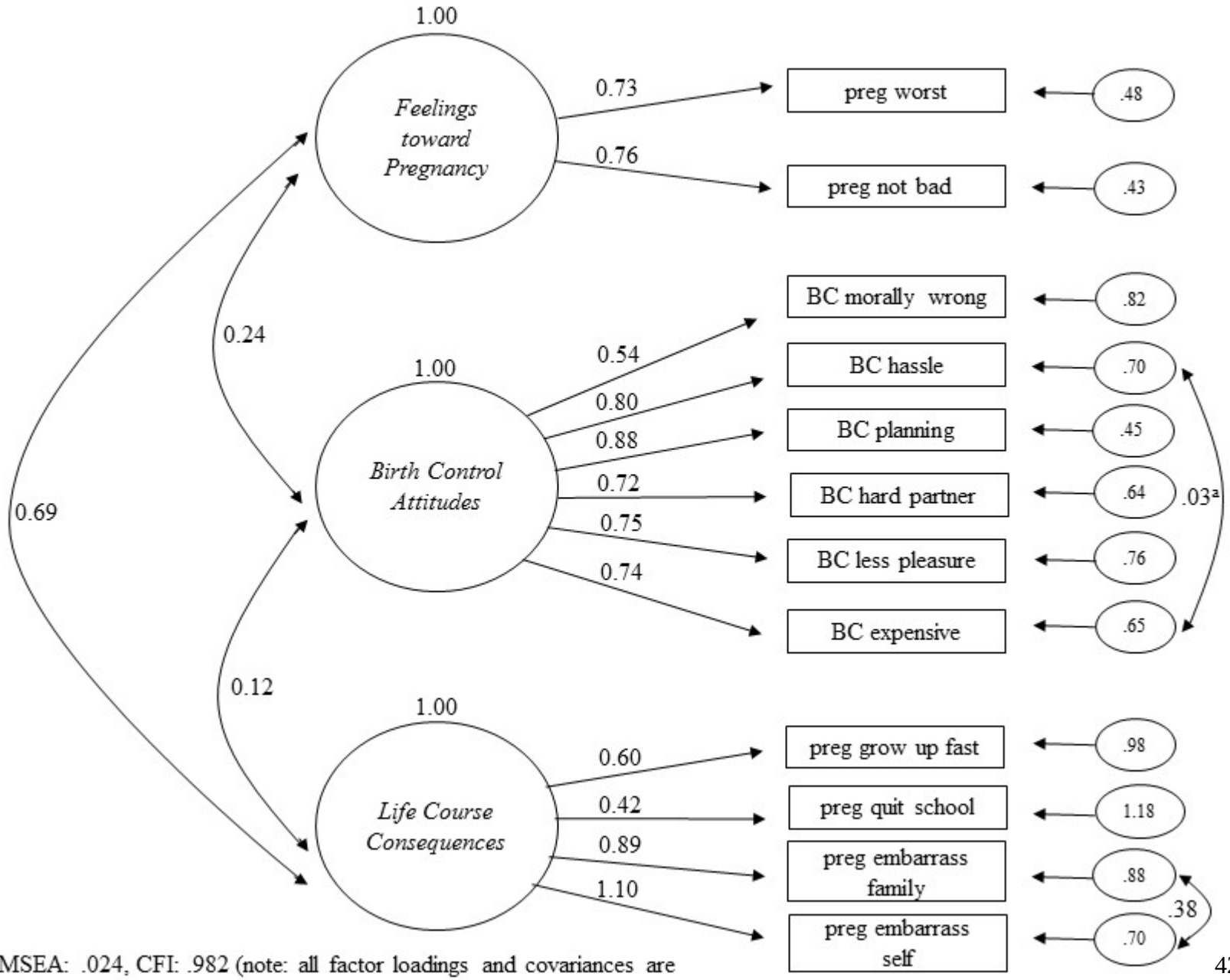
*p < .05

Table 6. Factor Loadings from Exploratory Factor Analysis (EFA) for Three-Factor Model of Reproductive Knowledge in Add Health

Factor 1	1	2	3
The most likely time for a woman to get pregnant is right before her period starts. *(before period)*	0.587*	-0.002	0.078
In general, a woman is most likely to get pregnant if she has sex during her period, as compared with other times of the month. *(during period)*	0.383*	0.215*	-0.021
Factor 2			
Even if the man pulls out before he ejaculates, even if ejaculation occurs outside of the woman's body, it is still possible for the woman to become pregnant. *(withdraw, get preg)*	-0.063	0.289*	0.027
When putting on a condom, it is important to have it fit tightly, leaving no space at the tip. *(condom fit tight)*	0.091*	0.489*	0.055
Vaseline can be used with condoms, and they work just as well. *(vaseline)*	-0.013	0.426*	-0.053
As long as the condom fit over the tip of the penis, it doesn't matter how far down it is unrolled. *(fully unroll)*	0.033	0.596*	-0.011
Factor 3			
You are quite knowledgeable about the rhythm method of birth control and when it is a "safe" time during the month for a woman to have sex and not get pregnant. *(rhythm confidence)*	0.007	-0.108*	0.772*
You are quite knowledgeable about how to use a condom correctly. *(condom confidence)*	-0.033	0.177*	0.659*
You are quite knowledgeable about the withdrawal method of birth control. *(withdraw confidence)*	0.032	0.003	0.951*

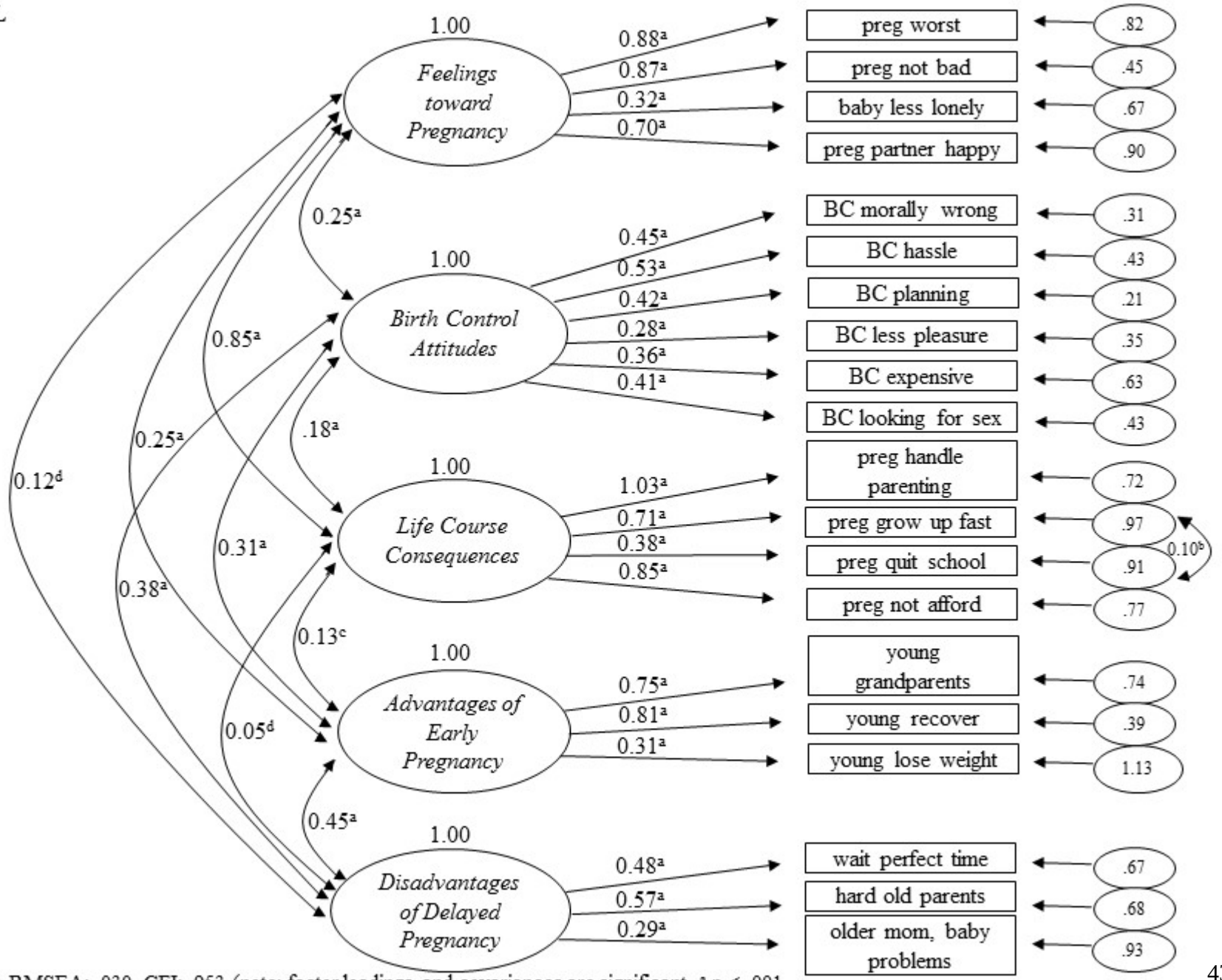
*p < .05

Figure 1: Factorial Model of Reproductive Attitudes from Confirmatory Factor Analysis (CFA), Add Health



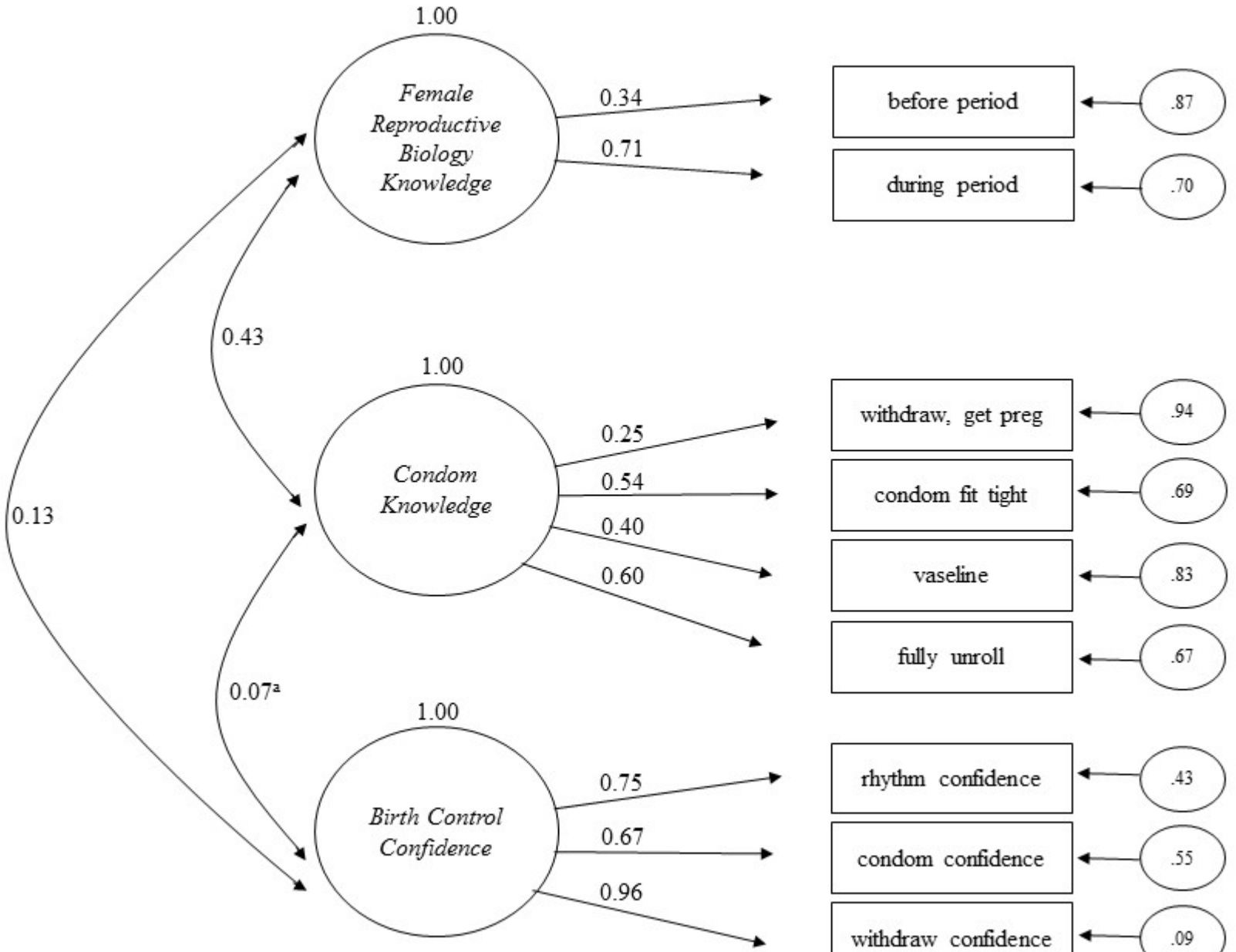
Model Fit: RMSEA: .024, CFI: .982 (note: all factor loadings and covariances are significant, $p < .001$, $^{a}p < .05$)

Figure 2: Factorial Model of Reproductive Attitudes from Confirmatory Factor Analysis (CFA), RDSL



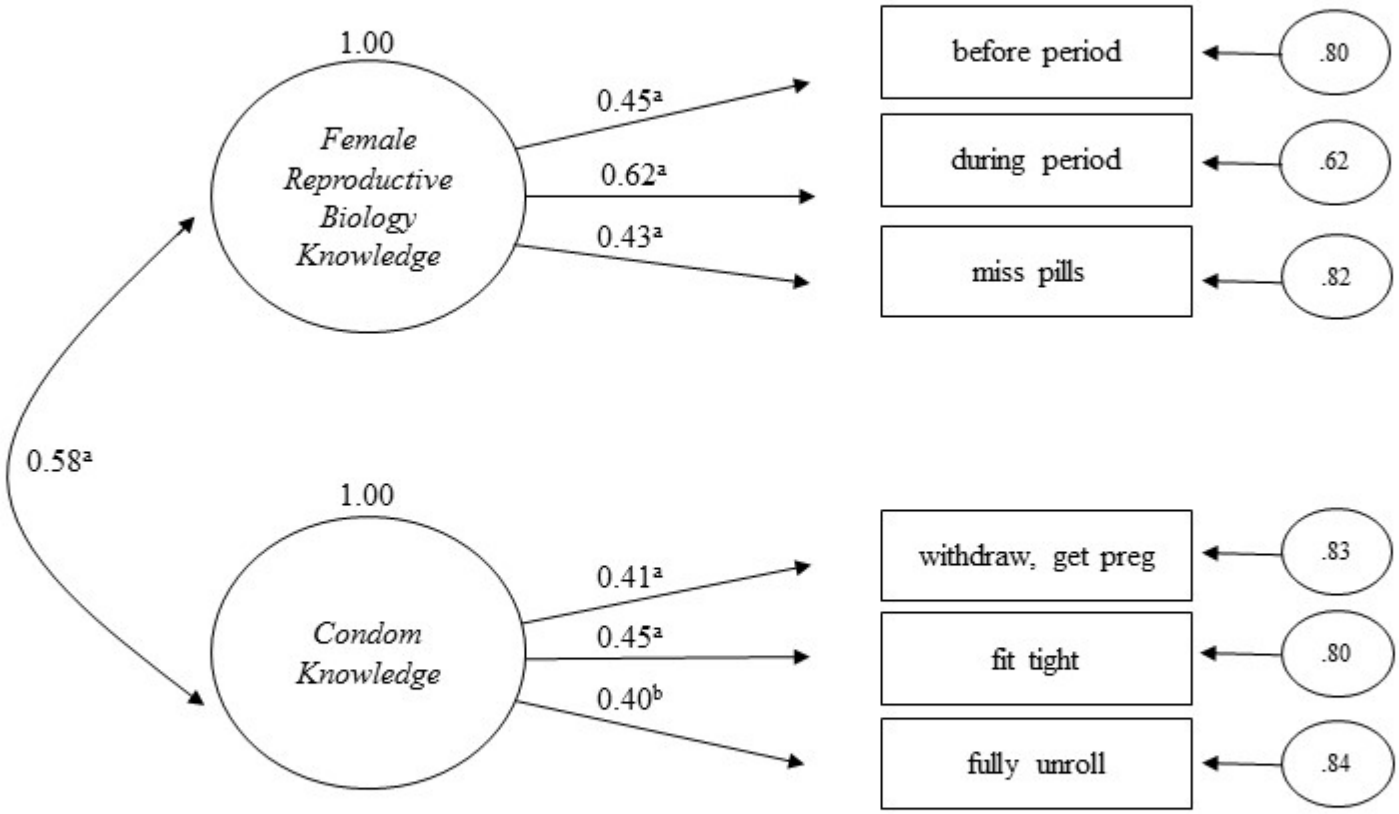
Model Fit: RMSEA: .030, CFI: .953 (note: factor loadings and covariances are significant, [a] $p < .001$, [b] $p < .01$, [c] $p < .05$, not significant [d])

Figure 3: Factorial Model of Reproductive Knowledge from Confirmatory Factor Analysis (CFA), Add Health



Model Fit: RMSEA: .015, CFI: .981 (note: all factor loadings and covariances are significant, $p < .001$, $^{a}p < .05$)

Figure 4: Factorial Model of Reproductive Knowledge from Confirmatory Factor Analysis (CFA), RDSL



Model Fit: RMSEA: .027, CFI: .943 (note: the covariance and all factor loadings are significant $^{a}p < .001$, $^{b}p < .01$)