ESSAYS ON ASSORTATIVE MATING:

BODY WEIGHT, RELATIONSHIPS, AND HEALTH

A Dissertation

Presented to the Faculty of the Graduate School

of Cornell University

In Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

by

Julia Howard Carmalt

August 2009

ESSAYS ON ASSORTATIVE MATING:
BODY WEIGHT, RELATIONSHIPS, AND HEALTH

Julia Howard Carmalt, Ph. D.
Cornell University 2009

This dissertation estimates patterns of assortative mating for body weight using two underutilized dyadic datasets: the Marital and Relationship Survey (MARS) and the Add Health Romantic Pairs data. The dissertation includes three distinct chapters.

The first chapter examines weight concordance among dating, cohabiting, and married young adult couples and provides an empirical test of the winnowing hypothesis. The winnowing hypothesis asserts that progression of intimate relationships toward marriage is marked by increasing levels of homogamy among partners. This Add Health study utilizes log-linear models to identify associations in cross-classifications of male partner and female partner BMI status data (underweight, healthy weight, overweight, obese) while simultaneously controlling for the marginal distribution of male and female partners' BMI status by union type. Results demonstrate evidence of "reverse winnowing:" Dating couples exhibit the strongest BMI status concordance, followed by cohabiting and then married couples. Consistent with a stigma effect, obese individuals are more likely to be in weight concordant unions.

The second chapter examines spousal differences in BMI. Mechanisms for BMI concordance and discordance are reviewed and a female-thinner norm is proposed. In MARS data, multilevel and fixed effects regression are used to statistically control for passive matching effects of social homogamy and convergence

and to address unobserved heterogeneity between spouses. Results suggest wives tend to significantly outweigh their husbands although not by much. BMI differences among higher educated husbands and wives are consistent with a female-thinner norm. Studies that fail to control for unobserved heterogeneity may report biased spousal associations.

The third chapter (coauthored with John Cawley, Kara Joyner, and Jeffery Sobal) uses Add Health data to examine both physical and sociodemographic characteristics young adults trade in order to obtain a physically attractive romantic partner. Focusing on one specific correlate of attractiveness – body weight – the study shows obesity reduces the likelihood of being matched with a physically attractive romantic partner, particularly among white women. Women, like men, trade education status for a physically attractive partner.

Despite new evidence presented in this dissertation, assortative mating for body weight is a complex social phenomenon that has yet to be fully explored.

BIOGRAPHICAL SKETCH

Julia (Julie) Carmalt took a non-traditional (and somewhat adventurous) route to obtaining a Ph.D. degree at Cornell University. As an undergraduate student at Humboldt State University in California, Julie majored in liberal arts with a concentration in recreation administration. Julie pursued a degree in recreation administration so she could advance her then career of developing, facilitating, and administering programs for children and adults with developmental and physical disabilities. After graduating with Honors and receiving the Academic Achievement Award in recreation administration, Julie moved to Moab, Utah to work as a river rafting guide with Splore – a nonprofit organization dedicated to providing accessible outdoor adventure to people of all abilities and needs. It was on a river trip for adjudicated youth that Julie realized she wanted to work with adjudicated and incarcerated youth. She moved to Salt Lake City and pursued employment with the Utah Division of Youth Corrections. In her work as a treatment counselor and case manager, Julie became fascinated with the apparent relationship between young women's body weight, their romantic relationships, and their health-risk and criminal behaviors. In order to examine these associations more closely, in 2001 Julie enrolled in the University of Utah, Department of Family and Consumer Sciences, to pursue an M.S. degree in Family Ecology. At the University of Utah, Julie served as the research coordinator for a qualitative study of juvenile female offending under the direction of Dr. Paula Smith. She also completed a master's thesis, under the direction of Dr. Kevin Rathunde, which examined the effect of self-objectification on middle school students' quality of experience. During her masters' studies, Julie became especially interested in family, social, and health policy which lead to her pursuit of a Ph.D. in the Department of Policy Analysis and Management at Cornell University under the direction of Dr. Kara Joyner. During Julie's tenure as a Ph.D. student, Dr. Joyner moved to the Department of Sociology at Bowling Green State University in Ohio and Julie was fortunate enough to be able to continue her studies under the direction of Dr. Daniel Lichter. Julie Carmalt successfully defended her dissertation with concentrations in family and social welfare policy, demography, and health policy in the Summer of 2009. She looks forward to teaching health courses, working with the Sloan Master of Health Administration program, as well as continuing her research on body weight, relationships, and health as a Lecturer in the Department of Policy Analysis and Management at Cornell University.

For my mother…with gratitude for her unwavering support.

ACKNOWLEDGMENTS

I must begin with grateful acknowledgement of my amazing doctoral committee: Dr. Daniel Lichter, Dr. Kara Joyner, Dr. Jeffery Sobal, and Dr. John Cawley. A better group of scholars – each with his or her unique talents, ideas, energy, backgrounds, camaraderie, and interests – that sustained me through my years of study and research could not have been assembled. Each provided me with opportunities for professional development and research beyond this dissertation and served as a mentor and role model. Because of their example, I realized the importance of humor in academia and I am grateful for such a brilliant and professional yet down-to-earth committee. I enjoyed working and publishing with each of them and look forward to continued collaborations. I am especially grateful to both Drs. Daniel Lichter and Kara Joyner for serving at different times as my committee chair. Each brought different strengths and perspectives to the production of this dissertation and their individual and combined expertise served me well.

Other amazing individuals are also owed thanks. Cathleen Zick and Ken Smith got me started on this journey and were always there when I needed them. I look forward to continued professional collaboration and friendship. Keith and Marty Bryant were my gracious welcome wagon in Ithaca. I am grateful for their friendship, support, youthful example, and for feeding me well. Rachel Dunifon provided opportunities for research collaboration as well as amazing example. Francoise Vermeylen, Jordan Matsudiara, and Keith Bryant provided much needed statistical consulting assistance.

A huge debt of gratitude is owed to my mother, Carole Palmer. From the initial U-haul journey across the country with me (even though she wore her crazy "Tron" glasses and wouldn't let me drive) to our spirited graduation weekend, I am thankful for her support, generosity, wardrobe overhaul, morning e-chats, crack-ups, surprising care packages, advice, and encouragement. I am proud you are my mother.

I am also especially grateful for my partner, Paul Wiech, for his patience, encouragement, humor, and tolerance during the long research and writing process. Paul helped me learn to balance my academic life with adventure and fun (something I am still learning), without which I may not have survived with my sanity intact. Paul shared the Adirondack mountains and his wonderful and funki-licious family with me, cooked me many a fabulous dinner (and great egg sandwiches), picked me up after long days and took me to Maxie's, danced with me in the house, made me laugh after a good cry, and was there during both crunch times and celebrations. I thank you and love you.

My phenomenal friends provided constant encouragement, support, laughs, and adventures. They are role models, gifts, true friends, and brilliant comrades, particularly Christa Downey, Bronwyn Butcher, Kyle Downey, Dirk Swart, Dave Makar, Arjan Makar, Melissa Burns, Bootsie Colella, Missy Aprea, Denise Shandroff, Michael Shandroff, and Sara Giroux.

I wish to extend a special thank you to Dr. Karen Williams for helping me find my inner badass.

Many thanks are owed to the current and former graduate student residents of MVR 436/B10/155, particularly Kai-Wen Cheng, Fenaba Addo, Asia Sikora, Max Schmeiser, Bridie Farrell, and Felicia DeLeone, for their camaraderie, support, and laughs and to the participants of the PAM graduate student RIP forum for encouragement, collegial criticism, and advice during research writing.

There are many individuals in the PAM department whose work made life a lot easier: Geysa Smiljanic, Pat Avery, Lillian Henry, Angelica Hammer, Tina Daddona, Pat Lauper, Erin Oates, Lois Brown, John Hill, and Richard Hines.

Importantly, I would like to acknowledge generous funding support received from the Rebecca Quinn Morgan-Jean Failing Fellowship in the College of Human Ecology at Cornell University, the Human Ecology Alumni Association, the Bronfenbrenner Life Course Center, the Mario Einaudi Center for International Studies, Cornell's Department of Policy Analysis and Management, and the Cornell Graduate School.

Finally, this dissertation could not have been completed without the use of dyadic data. I am greatly appreciative of the spouses and partners who participated in the Longitudinal Study of Adolescent Health (Add Health) and the Marital and Relationship Survey (MARS). Support of the collection of these data is acknowledged below.

Add Health is a program project designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris, and funded by a grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 17 other agencies. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Persons interested in obtaining data files from Add Health should contact Add Health, Carolina Population Center, 123 W. Franklin Street, Chapel Hill, NC 27516-2524 (addhealth@unc.edu). No direct support was received from grant P01-HD31921 for this analysis.

MARS data collection was supported by the Initiative in Population Research at The Ohio State University and by Cornell University's Bronfenbrenner Life Course Center.

An amended version of Chapter 3 was previously published by Blackwell Publishing in the *Journal of Marriage and Family* in 2008.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

BODY WEIGHT CONCORDANCE AMONG DATING, COHABITING, AND MARRIED YOUNG ADULT COUPLES: ANALYSIS OF REVERSE WINNOWING

Abstract

The study provides estimates of body weight concordance among dating, cohabiting, and married young adult couples and provides an empirical test of the winnowing hypothesis with respect to couples' body weight measured using body mass index (BMI). Using romantic pair data from the National Longitudinal Survey of Adolescent Health 2001-2002 which contains information on roughly 500 dating, 500 cohabiting, and 500 married couples, the study applied log-linear models (i.e., quasi-independence and symmetry parameters) to cross-classified data about partners' BMI status by union type. Partners' BMI status was cross-classified as underweight, healthy weight, overweight, and obese. Union type was classified as dating, cohabiting, and married. Log-linear models detect patterns of association while controlling for male-female partner differences in the marginal distributions of BMI status by union type. Results indicated BMI concordance accounts for much of the association in the data. BMI concordance varied by the BMI status of the couple but not by union type. Asymmetry in the data reflected a female-thinner norm. Consistent with a stigma effect, concordance for obesity was stronger than concordance for overweight or healthy weight across all union types. Dating couples were most likely to exhibit BMI concordance whereas married couples were least likely to exhibit BMI concordance. Results are consistent with a reverse winnowing process whereby relationships tend to be *less* selective in terms of similarity for physical appearance as relationships progressed in marriage.

Introduction

The winnowing hypothesis asserts that observed patterns of homogamy among married spouses result from the dissolution of heterogeneous dating and cohabiting relationships and the progression of homogamous relationships toward marriage (Blackwell & Lichter, 2004). Consequently, progression of intimate relationships – from dating to cohabiting to married relationships – tends to be marked by increasing levels of homogamy for ascribed and achieved characteristics. Some evidence of winnowing has been found for race, religion, and socioeconomic status, with married spouses exhibiting the greatest homogamy and dating partners the least homogamy (Blackwell & Lichter, 2004).

Married spouses have been shown to exhibit homogamy for weight as measured by body mass index (BMI) (Pennock-Román, 1984; Jeffery & Rick, 2002; The & Gordon-Larsen, 2009). Whether mate selection for BMI shows evidence of winnowing has yet to be determined. This analysis sought to: (1) provide estimates of BMI homogamy or concordance among dating, cohabiting, and married young adult couples, and (2) provide an empirical test of the winnowing hypothesis for partner BMI status. I hypothesize a pattern of "reverse winnowing" will be evident for BMI status; increasing levels of relational commitment will be marked by *decreasing* selectivity with respect to similarity for BMI status. In other words, as couples progress through a series of progressively more committed relationships towards marriage, selectivity with respect to similarity for BMI will decrease, and concordance for BMI will decline. I test this hypothesis using data on approximately 500 dating, 500 cohabiting, and 500 married couples from the National Longitudinal Survey of Adolescent Health (Add Health).

Mate Preferences and Partner Concordance

Partner concordance due to selection is presumed to result from competition in a mating market. Mating market exchange theories emphasize the bundle of attributes – both desirable and undesirable – that women and men exchange in order to get the best possible "match" (England & Farkas, 1986). When characteristics are highly desired by both partners, market exchange processes tend to result in patterns of homogamy as individuals with similar or concordant values on the desired characteristic pair up (Murstein, 1972; England & Farkas, 1986). As individuals make short- and long-term mate selection decisions – or form increasingly committed relationships as they progress toward marriage – the criteria on which they select a mate are presumed to change (e.g., Regan, Levin, Sprecher, Christopher, & Cate, 2000; Regan & Berscheid, 1997) resulting in differing levels of homogamy for certain characteristics and producing winnowing patterns. For example, characteristics that become more salient with commitment should exhibit stronger concordance among couples with higher levels of commitment.

Previous research documents considerable evidence of spousal concordance for BMI (Hebebrand, et al., 2000; Katzmarzyk, Hebebrand, & Bouchard, 2002; Silventoinen, Kaprio, Lahelma, Viken, & Rose, 2003). Additional research shows that engaged non-cohabiting couples exhibit similar levels of BMI concordance to married couples (Allison, Neale, Kezis, Alfonso, Heshka, & Heymsfield, 1996). However, no previous studies (to my knowledge) have examined BMI concordance among dating couples or compared prevalence of BMI concordance between dating, cohabiting, and married unions. One investigation reported that married spouses are three times as likely to be obese concordant and cohabiting partners are nearly twice as likely to be obese concordant than nonobese concordant dating partners (The & Gordon-Larsen, 2009). However, it remains unclear whether dating, cohabiting, and married partners exhibit similar or different levels of BMI concordance. Moreover, it is unknown whether BMI concordance across union types varies by the BMI status of the couple (e.g., whether concordance differences exist for underweight concordant, healthy weight concordant, overweight concordant, and obese concordant couples). There is some evidence that assortative mating for BMI varies across the distribution of BMI, with the strongest interspousal BMI correlations reported among obese couples (Katzmarzyk et al., 2002). Katzmarzyk and colleagues propose that the stigmatization of obesity is responsible for stronger assortative mating among the obese.

Research that examines the importance of physical attractiveness in mate selection may provide a basis from which to derive hypotheses about BMI concordance and union type. Previous research shows physical attractiveness – of which BMI is a correlate (Singh & Young, 1995) – matters less when selecting long-term relative to short-term partners (Regan et al., 2000; Regan & Berscheid, 1997). For example, Regan and Bersheid (1997) found that physical attractiveness and good health ranked highest in preference for a short-term sexual partner whereas trustworthiness, personality, and intelligence ranked highest in preference for a long-term marriage partner. Similar findings were reported by Regan et al. (2000) who evaluated preference differences in short-term sexual and long-term romantic partners and by Regan and Joshi (2003) who examined these differences among adolescents. These findings are consistent with a process of "reverse winnowing" whereby the importance of physical attractiveness in a mate declines as couples progress along a relational continuum. Because the importance of physical attractiveness declines as relationships increase in commitment level, matching for physical attractiveness is presumed to decline since more committed couples sort on other non-physical characteristics. Because BMI is a correlate of physical attractiveness, BMI concordance should also demonstrate reverse winnowing: BMI concordance is hypothesized to be strongest among dating partners and weakest among married spouses.

The sparse existing evidence about winnowing for physical attractiveness is mixed. White (1980) found interpartner attractiveness correlations decreased with increasing relational commitment; reported interpartner attractiveness correlations were .63, .56, and .18 for casual daters, serious daters, and engaged couples, respectively. Conversely, McKillip and Redel (1983) found interpartner attractiveness correlations increased with increasing relational commitment; reported interparter attractiveness correlations were .26, .37, and .48, for casual daters, steady daters, and committed couples, respectively. Additional research by Kurzban and Weeden (2005) showed men select women for dates based on discordant (i.e., lower than their own) BMI, rather than concordant BMI. Thus, it is possible that concordance accounts for only some of the association between romantic partners' BMI status and that certain patterns of discordance may also be evident. For example, BMI status discordant couples may demonstrate evidence of a female-thinner norm whereby non-concordance among romantic partners or spouses is socially and culturally acceptable so long as it is the male partner who is heavier than the female partner and not vice versa (Carmalt, 2009).

Estimating patterns of concordance and gender asymmetry (e.g., whether female partners tend to be leaner than their male partners) using data on couples in different type of unions (e.g., dating, cohabiting, married) requires statistical methods that control for differences in the marginal distribution of couples by BMI status and union type. Studies have shown that body weight not only affects selection into romantic unions but also that entry into romantic relationships affects body weight. For example, married individuals are more likely to be obese than nonmarried individuals (Averett, Sikora, & Argys, 2008; Sobal, Rauschenbach, & Frongillo, 2003) and single individuals are leaner than cohabiting and married individuals (The & Gordon-Larsen, 2009). The study, therefore, applies various log-linear models to cross-classifications of partner BMI status data (underweight, healthy weight, overweight, obese) for dating, cohabiting, and married couples. The key advantage of using log-linear models is the ability to estimate associations between partners' BMI status for different union types while simultaneously controlling for partner differences in the marginal distributions of BMI status by gender and by union type. Focusing on a single measure of differences in assortative mating between dating, cohabiting, and married couples – odds of BMI status concordance – the study provides concordance estimates among dating, cohabiting and married partners, and provides an empirical test of the reverse winnowing hypothesis using couples' BMI status data. Additional testing for evidence of a female-thinner norm is also conducted.

Method

Data

Data for this study come from National Longitudinal Survey of Adolescent Health (Add Health). The Add Health Wave 1 baseline survey was a nationally representative sample of U.S. students attending grades 7 to 12 during the 1994-1995 academic year. Most of the 20,745 Wave 1 respondents who completed in-home questionnaires in this sample were aged 12-18 at first interview. A total of 15,197 original Wave 1 respondents completed Wave 3 in-home interviews (73%) in 2001-2002 and answered questions about past and current romantic and sexual relationships.

Unique to Add Health is the Romantic Pair data that collected information from roughly equal proportions (about one-third each) of 1,507 married, cohabiting, and dating partners of Wave 3 respondents. Most Wave 3 respondents were aged 18 – 24. Wave 3 respondents reporting current romantic relationships of at least 3 months duration with opposite-sex partners who were at least 18-years-old were asked to recruit their partners for participation in the Wave 3 interview.

The Romantic Pair data are appropriate for this study because they contain information about *both* partners' BMI for roughly equal numbers of dating, cohabiting, and married partners. BMI was calculated from weight and height measured by Add Health interviewers using the formula weight in kilometers divided by height in meters squared. Nine percent of the sample (n = 122 couples) was missing data about measured height and/or weight used to calculate BMI. Self-reported height and/or weight were substituted where available (103 substitutions for 122 missing cases). Because of the temporary weight gain associated with pregnancy, 102 couples with pregnant female partners (7% of the sample) were excluded. Thus, the analytic sample is comprised of 1,386 couples (498 dating, 459 cohabiting, and 429 married couples).

Analytic Strategy

In this study, I measure differences in BMI concordance among dating, cohabiting, and married couples by calculating concordance parameters from various log-linear models fitted to cross-classified data of male and female partners' BMI status. Concordance parameters provide an easily interpretable and straightforward description of the association between male and female partners' BMI in terms of the odds that romantic partners have the same, rather than different, BMI status. Log-linear models permit the identification of associations between partners' BMI status independent of the marginal distributions of partners' BMI and differences in these distributions by union type. Table 1.1 presents the differences in the distribution of men's and women's BMI status by union type.

Table 1.1. BMI Status Distribution among Dating, Cohabiting, and Married Young Adult Couples.

	Women			Men		
	Dating (N = 498)	Cohabiting (N = 459)	Married (N = 429)	Dating (N = 498)	Cohabiting (N = 459)	Married (N = 429)
Body mass index	24.92_{ab}	25.94_{ac}	27.59_{bc}	26.17_{b}	26.81_{c}	28.01_{bc}
	(5.96)	(6.66)	(6.87)	(5.26)	(5.90)	(5.57)
Obese	0.16_{ab}	0.22_{ac}	0.32_{bc}	0.20_{b}	0.24_{c}	0.34_{bc}
Overweight	0.19	0.24	0.25	0.29	0.34	0.34
Healthy weight	0.59_{ab}	0.48_{ac}	0.39_{bc}	0.49_{ab}	0.39_{ac}	0.30_{bc}
Underweight	0.06	0.06	0.04	0.01_{a}	0.03_{a}	0.02

Note: Means (and standard deviations) for continuous variables. Values in the same row that share a subscript differ across relationship type, within gender, at $p < .05$.

Table 1.1 reports that married men and women are heavier than dating and cohabiting men and women. Dating men and women are more likely to have a BMI in the recommended healthy weight range relative to cohabiting and married men and women, whereas married men and women are more likely to be obese than dating and cohabiting men and women. Table 1.1 also reports that, within gender, differences in the distribution of BMI status across union type seem to exist. For example, more married women have healthy BMI status than obese BMI status (39% versus 32%), whereas among men, more married men have obese BMI status than healthy BMI status (34% versus 30%). Log-linear models are necessary to take into account the marginal differences in male and female partners' BMI status across union types.

Log-linear models require count data. The contingency table for BMI status was produced by cross-classifying female partner's and male partner's BMI status as (1) under weight (BMI < 18.5), (2) healthy weight (18.5 ≤ BMI < 25), (3) overweight (25 ≤ BMI < 30), and (4) obese (BMI ≥ 30), by union type resulting in a 48 cell table (4 X 4 X 3) of count data (see Table 1.2).[1]

[1]BMI status was calculated using cutoffs defined by the World Health Organization (1997).

Table 1.2. Cross-classifications of Male Partner and Female Partner BMI Status by Union Type (Count Data).

Dating Partners

Male BMI Status	Female BMI Status: Under-weight	Healthy weight	Over-weight	Obese	Total
Underweight	3	3	0	0	6
Healthy weight	18	158	38	32	246
Overweight	5	88	38	14	145
Obese	3	46	20	32	101
Total	29	295	96	78	498

Cohabiting Partners

Male BMI Status	Female BMI Status: Under-weight	Healthy weight	Over-weight	Obese	Total
Underweight	3	7	2	3	15
Healthy weight	20	96	39	24	179
Overweight	5	79	36	36	156
Obese	1	36	33	39	109
Total	29	218	110	102	459

Married Partners

Male BMI Status	Female BMI Status: Under-weight	Healthy weight	Over-weight	Obese	Total
Underweight	0	5	3	1	9
Healthy weight	9	60	32	27	128
Overweight	3	63	39	42	147
Obese	4	41	32	68	145
Total	16	169	106	138	429

Concordance parameters are estimated using forward selection. The method of forward selection requires first fitting a baseline model that assumes no association in the data and then adding association parameters to the model based on the hypotheses.

The goodness-of-fit of a given model is assessed by comparing the observed cell frequencies with those estimated by the model using the likelihood-ratio chi-square statistic, L^2. The difference in L^2 values between a pair of models in the sequence provides a measure of the importance of the parameter being added (Upton, 1991). Odds of concordance from the "best fitting" model are then used to describe the assortative mating patterns of the male and female partners by union type.

I begin the sequence by fitting the *independence model* as the baseline model. The independence model includes only the marginal effects of BMI status and assumes relationships are completely random with respect to BMI. Formally, the independence model is:

$$\log F_{ij} = \lambda + \lambda_i^m + \lambda_j^f \qquad (1)$$

where m denotes male partner's BMI status ($i = 1,\ldots,4$) and f denotes female partner's BMI status ($j = 1,\ldots,4$). Thus, F_{ij} is the expected number of unions between males in BMI category i and females in BMI category j.

I next fit the *main diagonal model* or concordance model which tests whether the statistical relationship between partner BMI status is confined to the table's main diagonal. The concordance parameter reflects whether the cells along the diagonal attract more observations than would be expected if mate selection was purely random. The main diagonal model is:

$$\log F_{ij} = \lambda + \lambda_i^m + \lambda_j^f + \delta^h \qquad (2)$$

where h = 1 if male partner's BMI status equals female partner's BMI status, else 0, and δ^h estimates the difference in the log odds of concordance for the sample as a whole. The third model fit is the *variable diagonal model* which tests whether clustering of observations along the diagonal in the table varies within each diagonal BMI group. In other words, this model permits BMI concordance to vary by BMI status (e.g., for underweight-concordant, healthy weight-concordant, overweight concordant, and obese concordant couples). The variable diagonal model is:

$$\log F_{ij} = \lambda + \lambda_i^m + \lambda_j^f + \delta_{ij}^v \qquad (3)$$

where $v = 1$ for *each* $i = j$ for male and female partner BMI status, else 0, and δ_{ij}^v estimates the difference in the log odds of homogamy for each diagonal cell. These are the main parameters of interest in this study. I hypothesize the variable diagonal model will fit the data better than the main diagonal model and thus the variable diagonal parameter is retained in the models below.

Models 2 and 3 above assume that BMI discordant couples (e.g., couples located above and below the table's main diagonal) are distributed randomly. I next fit a *gender asymmetry model* that relaxes the assumption of random mating in off-diagonal cells. Specifically, the asymmetry parameter used in this study tests whether females tend to be relatively leaner (e.g., are in a lower BMI status group) than their male partners. In other words, this model tests whether cells located *below* the diagonal attract more observations than would be expected if mate selection among BMI discordant couples was purely random. The model that includes the gender asymmetry parameter is:

$$\log F_{ij} = \lambda + \lambda_i^m + \lambda_j^f + \delta_{ij}^v + \zeta^a \qquad (4)$$

where $a = 1$ if $i > j$; else 0, and ζ^a estimates the difference in the log odds of pairing for couples located below the diagonal.

Once the best fitting among these models is determined, the next step is to examine whether the concordance parameters (δ_{ij}^v) vary by union type. I first fit a model that includes interactions between the marginal effects and union type. This model controls for differences in the distribution of male and female partner BMI status across dating, cohabiting, and married couples and provides a baseline fit to test whether adding interactions between union type and the concordance parameters and gender asymmetry parameters improve the fit of the model. Assuming the best fitting model is Model 4, the baseline interaction model is:

$$\log F_{ijk} = \lambda + \lambda_{ik}^{mu} + \lambda_{jk}^{fu} + \delta_{ij}^{v} + \zeta^{a} + \gamma_{k}^{u} \tag{5}$$

where and u denotes union type (k = 1,2,3) and F_{ijk} is the expected number of unions between males in BMI category i and females in BMI category j and union type k.

I then add to Model 5, interactions between the concordance parameters and union type to test whether concordance differences by BMI status vary across unions. The model is then:

$$\log F_{ijk} = \lambda + \lambda_{ik}^{mu} + \lambda j_{k}^{fu} + \delta_{ijk}^{vu} + \zeta^{a} + \gamma_{k}^{u} \tag{6}$$

where δ_{ijk}^{vu} estimates the difference in the log odds of homogamy for each diagonal cell for each union type.

Finally, interactions between the gender asymmetry parameter and union type are included to test whether evidence of the female-thinner norm exists across union types. This model is:

$$\log F_{ijk} = \lambda + \lambda_{ik}^{mu} + \lambda j_{k}^{fu} + \delta_{ijk}^{vu} + \zeta_{k}^{au} + \gamma_{k}^{u} \tag{7}$$

where ζ_{k}^{au} estimates the difference in the log odds of men "marrying up" in physical attractiveness for each union type.

Results

Table 1.3 displays the percentage of BMI status concordant relationships by BMI status for all couples and also by union type. Approximately 41% of all couples were BMI concordant. Prevalence of concordance varied by BMI status; 55% of all concordant couples were healthy weight concordant, 24% were obese concordant, 20% were overweight concordant, and about 1% of all concordant couples were underweight concordant. Prevalence of concordance also varied by union type; dating couples showed the greatest amount of concordance (46%) and married and cohabiting couples showed lower but similar levels of concordance (39% and 38%, respectively).

Prevalence of concordance also varied by BMI status within union type. Of

BMI concordant dating and cohabiting couples, most couples were healthy weight concordant (68% and 55% of concordant dating and cohabiting couples, respectively), whereas among married couples, most couples tended to be obese concordant (41% of concordant married couples). Dating couples were the least likely to be obese concordant (14% of concordant dating couples).

Table 1.3. Percent of BMI Concordant Relationships for all Unions and by Union Type.

	All (N = 1,386)	Dating (N = 498)	Cohabiting (N = 459)	Married (N = 429)
Obese	10.03 (139)	6.43 (32)	8.50 (39)	15.85 (68)
Overweight	8.15 (113)	7.63 (38)	7.84 (36)	9.09 (39)
Healthy weight	22.66 (314)	31.73 (158)	20.92 (96)	13.99 (60)
Underweight	0.43 (6)	0.60 (3)	0.65 (3)	0.00 (0)
n concordant	572	231	174	167
% concordant	41.27	46.39	37.91	38.93

Note: Counts are in parentheses. Concordance means both partners in a couple have the same BMI status using measured BMI (underweight, healthy weight, overweight, obese).

While the results shown in Table 1.3 may be informative, they may be confounded by the distribution of partners' BMI status within and across union types. Because body weight affects selection into different romantic unions as well as is affected by union status, estimates of BMI status concordance may be confounded by the marginal distribution of male and female partners BMI status by union type (see Table 1.2). Here, I turn to results of the log-linear analyses which control for any differences in the marginal distributions of BMI status by union type.

Model Fitting

Table 1.4 shows the likelihood ratio chi square statistics, L^2, and BIC statistics for the various models of assortative mating for BMI.[2] The first half of the table shows the results of fitting BMI concordance models when all relationships are combined. Model A1 is the independence model which includes only the marginal distributions of male and female partners. This model assumes no association between partners' BMI. The relatively large log-likelihood statistic shows the assumption of independence is incorrect. In fact, much of the association in the table is explained by BMI concordance; after controlling for partnerships along the main diagonal (Model A2), the L^2 statistic declines by nearly one-half using only 1 degree of freedom. Model A3 allows BMI concordance to vary by BMI status. The further reduction in L^2 indicates variation in BMI concordance by BMI status does indeed account for some of the association in the data. The negative BIC statistic indicates this model is preferred to the saturated model. Finally, Model A4 relaxes the assumption of random mating for off-diagonal partnerships by distinguishing couples below the diagonal from couples above the diagonal. This model fits the data more closely indicating non-concordant couples in which the female is thinner also account for some of the association in the table.

The second half of the Table 1.4 shows changes in BMI concordance by union type. When union status is introduced, the number of cells in the table triples, making it possible to examine differences in BMI concordance by union status. Model B1 provides a baseline fit to the table that includes interactions between the marginal effects of BMI status and union type only. The BIC statistic does not decline for Model B2 indicating variation in BMI concordance by BMI status is not different

[2] The smaller the L^2 the better the model fit. The BIC statistic adjusts the L^2 for sample size. BIC = L^2– (df)log(N). The smaller the BIC, the better the model fit. A negative value for BIC indicates the model fits the data better than the saturated model (where all possible interaction terms are included along with each marginal term).

across union types. Model B3 also does not improve model fit (relative to Model B1) indicating clustering of observations below the diagonal (i.e., evidence of a female-thinner norm) does not differ by union type.

Table 1.4. Log-linear models of assortative mating for BMI status among young adult couples in dating, cohabiting, and marital unions.

	L^2	df	BIC
A. BMI CONCORDANCE			
A1. Marginals	111	9	46
A2. Marginals + Main Diagonal	63	8	5
A3. Marginals + Variable Diagonal	32	5	-4
A4. Marginals + Variable Diagonal + Gender Asymmetry	24	4	-5
B. BMI CONCORDANCE AND UNION TYPE			
B1. A4 + Marginals x Union Type	36	19	-101
B2. B1 + Variable Diagonal x Union Type	30	12	-57
B3. B2 + Gender Assymetry x Union Type	27	10	-45

Note: N = 1,396 couples. Couples are cross-classified by BMI status using measured BMI (underweight, healthy weight, overweight, obese).

Concordance Parameters

Model A4 provided the best fit to the data among the first series of models and Models B1 – B3 showed BMI concordance and asymmetry did not vary by union type. Therefore, for my purposes, I fit Model 4A to cross-classified partner data separately for dating, cohabiting, and married couples. Log-linear models permit cross-union comparisons because any differences in the marginal distribution of BMI by union type are controlled (Blackwell & Lichter, 2004). Table 1.5 shows the parameter estimates and their exponents of BMI concordance for the three union types. The concordance parameters indicate how many more unions are in each diagonal cell than would be expected by chance alone (Blackwell & Lichter, 2004). A negative parameter indicates fewer unions than expected whereas a positive parameter indicates more unions that expected. It should be noted that concordance parameters for underweight couples are based on cell counts of 3, 3, and 0 for dating, cohabiting, and married couples, respectively and therefore are not presented here since the odds would be misleading.

Dating, cohabiting, and married young adults tend to pair concordantly with respect to BMI status (all but one of the concordance parameters are positive). Obese individuals are nearly 5 times ($e^{\beta} = 4.81$, $p < .001$) more likely to *date* another obese person than someone who is leaner (e.g., date concordantly versus discordantly); about 3 times ($e^{\beta} = 3.32$, p < .001) more likely to *cohabit* with another obese person, and nearly 3 times ($e^{\beta} = 2.69$, $p < .001$) more likely to be *married* to another obese person than a leaner individual. These results are consistent with a winnowing process for decreasing selectivity with respect to matching for physical appearance over the relational spectrum. Overweight individuals also exhibit evidence of winnowing albeit they have lower levels of concordance than do obese individuals. Overweight individuals are nearly 3 times ($e^{\beta} = 2.61$, $p < .01$) more likely to *date* another overweight person than someone who is not overweight, whereas overweight cohabiting and married individuals seem equally likely to partner with overweight individuals as those who are leaner or heavier. Healthy weight individuals are almost twice as likely to *date* ($e^{\beta} = 1.63$, n.s), more than twice as likely ($e^{\beta} = 2.14$, $p < .01$) to *cohabit* with, and tend to be equally likely to *marry* other healthy weight individuals than those who are leaner or heavier. The pattern of assortative mating among healthy weight individuals seems to demonstrate a U-shaped pattern with cohabiting couples exhibiting the highest BMI concordance.

For all union types, the estimate of the female-thinner effect is positive and among dating and cohabiting couples, the estimate is significantly different from zero. Overall, dating and cohabiting men partner with women who are relatively leaner than themselves providing some evidence of a female-thinner norm. These results are consistent with those reported by Kurzban and Weeden (2005) who found men select females with leaner BMI than their own as dates.

Table 1.5. Concordance Estimates and their Exponents of Partner BMI Status for Dating, Cohabiting, and Married Couples.

	Dating (N = 498)	Cohabiting (N = 459)	Married (N = 429)
Obese concordant			
β	1.57***	1.20***	0.99***
e^{β}	4.81	3.32	2.69
Overweight concordant			
β	0.96**	0.06	-0.10
e^{β}	2.61	1.06	0.90
Healthy weight concordant			
β	0.49	0.76**	0.28
e^{β}	1.63	2.14	1.32
Female-thinner effect			
β	0.88*	0.75*	0.07
e^{β}	2.41	2.12	1.07
L^2 (BIC)	4 (-21)	19 (-6)	7 (-17)
df	4	4	4
p	1.01	4.72	1.78

Note: Estimates and their odds produced from Model A4 in Table 2, run separately by union type. eβ is odds of concordance versus discordance for BMI status and union type. Estimates and their exponents for underweight concordance are not shown due to small sample sizes. L2 statistics, BIC statistics, and non-significant p-values indicate models fit the data for all union types.

Figure 1.1 presents the odds of BMI status homogamy reported in Table 1.5 in graphic form. The results are striking in their demonstration of a pattern of "reverse winnowing" wherein odds of BMI status concordance decrease, among all BMI statuses, as unions progress in relational commitment.

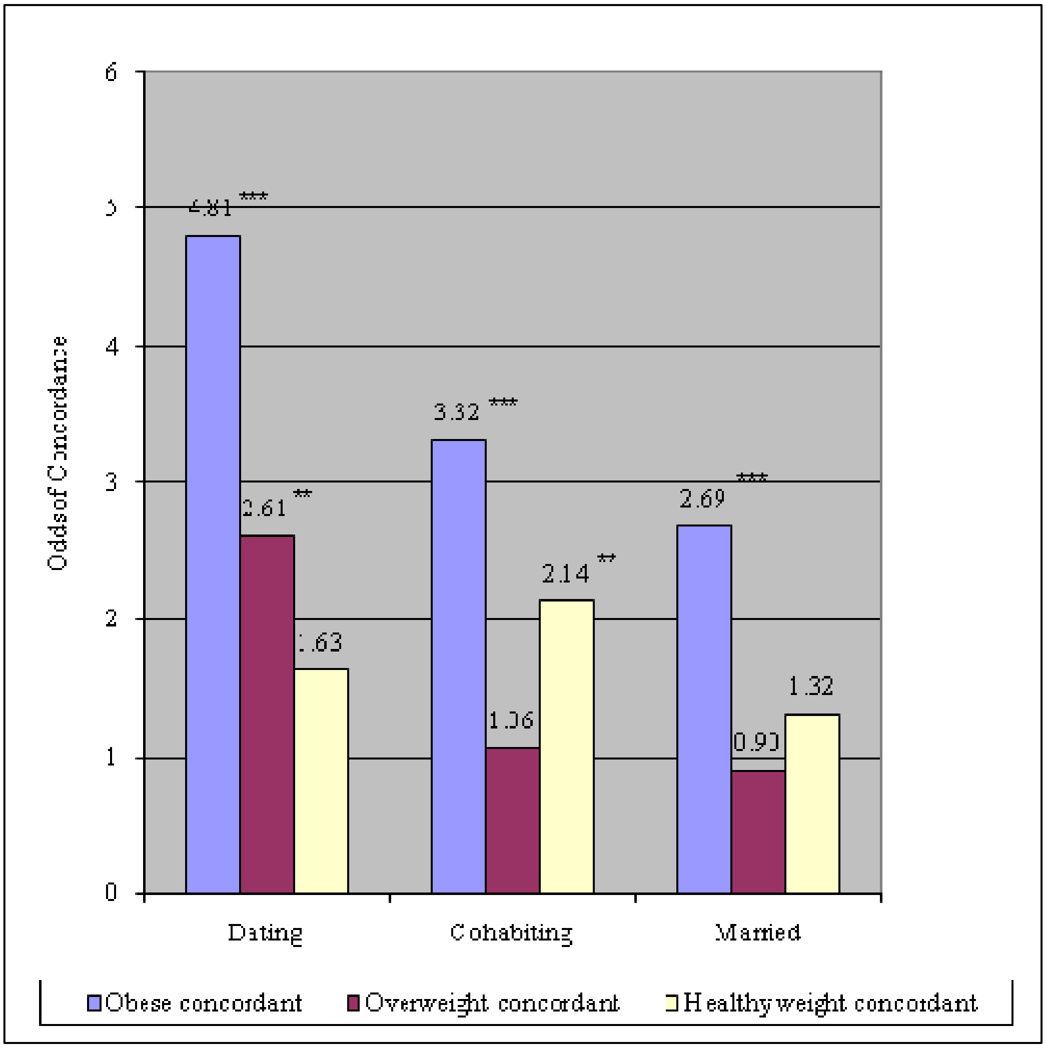

Figure 1.1. Odds of BMI Status Concordance by Union Type.

Discussion

This paper provides new evidence about assortative mating for body weight among young adult heterosexual couples. The study applies log-linear analyses to cross-classified data on partners' BMI status. Furthermore, the study empirically tests winnowing for physical appearance and provides estimates of BMI status concordance across union type and by BMI status within unions. Overall, BMI status concordance is the norm among dating, cohabiting, and married young adult couples. Although differences in BMI status concordance were not significant across union type, evidence of a reverse winnowing process was observed; transitions from dating to cohabiting to marital unions were marked by *decreasing* selectivity in the matching process. This finding is consistent with previous research that shows couples in relationships with greater levels of commitment may be less concerned about partner appearance (e.g., Regan & Berscheid, 1997; Regan et al., 2000; Regan & Joshi, 2003). This finding contradicts, however, previous research that shows increasing likelihood of shared obesity among cohabiting and married couples (The & Gordon-Larsen, 2009). Studies such as The and Gordon-Larsen's posit that shared environmental factors (e.g., shared meals, physical environment, and resources) are responsible for greater concordance among cohabiting and married couples than among dating couples. This study shows that among *all* obese and overweight concordant couples, dating couples have the greatest odds of concordance, relative to cohabiting and then married concordant couples. This finding is consistent with an active assortment effect, rather than a shared environment effect, that demonstrates a pattern of reverse winnowing – matching for BMI status decreases as relationships progress along a relational continuum. Future research, therefore, should not discount active partner selection when examining processes that produce positive assortative mating for BMI.

This study also found that obese individuals are more likely to be in concordant (relative to discordant) relationships, regardless of union type. This finding is consistent with previous research documenting the stigmatization of obese individuals (Puhl & Brownell, 2001; Sobal, 2005) and suggests that obese individuals may have fewer opportunities to become romantically involved with mates of leaner (i.e., nonconcordant) BMI status. Interestingly, in this study, the winnowing pattern observed among obese couples shows that obese individuals are more likely to *date* other obese individuals than to *marry* other obese individuals. This finding is consistent with research that shows obese women are less likely to marry (Averett & Korenman, 1999) however it suggests that when obese individuals do marry, they may marry partners with leaner BMI. Whether obese individuals date each other in perpetuity, diverge in BMI and eventually marry (or marry and then diverge in BMI), or eventually split and "intermarry" with spouses of different BMI status is a question for future research that requires longitudinal data. The findings reported in this study, using cross-sectional data on currently partnered couples, can only provide suggestive evidence of active assortment for concordance and of the winnowing hypothesis.

Overall, dating, cohabiting, and marital unions are marked by considerable BMI status concordance and odds of concordance were not found to vary by union type. Discordant unions tend to demonstrate evidence of a female-thinner norm. The overall findings of this study suggest active assortment plays a role in the BMI status composition of romantic couples. This study is limited in several important ways. First, the study focused only on a single measure of differences in assortative mating among dating, cohabiting, and married young adult couples: odds of concordance. Certainly a more detailed picture of assortative mating for BMI could be produced.[3] Furthermore, the results reported in this study may be confounded by environmental

[3] Attempts were made to estimate central crossing parameters and social distance parameters but the data lacked the degrees of freedom to accurately control for these associations in the data.

factors or by social homogamy (i.e., the tendency to partner concordantly with respect to sociodemographic characteristics such as age, race-ethnicity, and education that may spuriously produce BMI concordance). As larger couple-level datasets become available, future research should estimate concordance parameters that control for the marginal distribution of partners by relationship duration (to control for the effects of cohabitation on BMI concordance), and/or by age, race-ethnicity, and education status (to control for the effects of social homogamy on BMI concordance).[4] Finally, using BMI status to measure concordance among couples may not adequately sort couples based on BMI *similarity*. For example, a couple in which one partner has a BMI of 29 and the other partner has a BMI of 31 has an overall BMI difference of 2 but would be classified (according to the method used above) as BMI discordant, whereas a couple in which one partner has a BMI of 19 and the other has a BMI of 24 has an overall BMI difference of 5 but would be classified as BMI concordant. Again, having access to larger couple-level datasets will allow future researchers to define concordance more precisely.

Overall, dating, cohabiting, and married young adult romantic partners tend to resemble one another in BMI status, particularly obese and overweight partners, and tend to become less selective with respect to matching for BMI status as they progress in relational commitment. Whether winnowing is observed for other characteristics presumed to be important for developing lasting and healthy relationships – for example, whether young adults show increasing selectivity with respect to education, race-ethnicity, socioeconomic status, religion, and even for health behaviors – is an avenue of research for demographers to pursue in the future.

[4] Too many zero-count cells were produced when attempts were made to produce BMI status-by-union type-by-homogamy status contingency tables (e.g., a BMI status-by-union type-by-race homogamy status contingency table produces a 4 X 4 X 3 X 2 = 96 cell table).

REFERENCES

Allison, D. B., Neale, M. C., Kezis, M. I., Alfonso, V. C., Heshka, S. & Heymsfield, S. B. (1996). Assortative mating for relative weight: Genetic implications. *Behavior Genetics, 26*(2), 103-111.

Averett, S. L., Sikora, A., & Argys, L. M. (2008). For better or worse: Relationship status and body mass index. *Economics and Human Biology, 6*, 330-349.

Carmalt, J. H. (2009). Assortative mating for BMI: New evidence from multilevel and fixed effects models. Unpublished manuscript.

Blackwell, D. L., & Lichter, D.T . (2004). Homogamy among dating, cohabiting, and married couples. *The Sociological Quarterly, 45*(4), 719-737.

England, P., & Farkas, G. (1986). *Households, employment, and gender: A social, economic, and demographic view.* New York: Aldine Publishing Company.

Hebebrand, J., Wulftange, H., Goerg, T., Ziegler, A., Hinney, A., Barth, N., Mayer, H., & Remschmidt, H. (2000). Epidemic obesity: Are genetic factors involved via increased rates of assortative mating? *International Journal of Obesity, 24*, 345-353.

Jacobsen, P., Torgerson, J.S., Sjöström, L., & Bouchard, C. (2007). Spouse resemblance in body mass index: Effects on adult obesity prevalence in the offspring generation. *American Journal of Epidemiology, 165*(1), 101-108.

Jeffery, R. W., & Rick, A. M. (2002). Cross-sectional and longitudinal associations between body mass index and marriage-related factors. *Obesity Research, 10*(8), 809-815.

Katzmarzyk, P. T., Hebebrand, J., & Bouchard, C. (2002). Spousal resemblance in the Canadian population: Implications for the obesity epidemic. *International Journal of Obesity, 26*, 241-246.

Kurzban, R., & Weeden, J. (2005). HurryDate: Mate preferences in action. *Evolution* *and Human Behavior, 26*, 227-244.

McKillip, J., & Redel, S. L. (1983). External validity of matching on physical attractiveness for same and opposite sex couples. *Journal of Applied Social Psychology, 13*, 328-337.

Murstein, B. I. (1972). Physical attractiveness and marital choice. *Journal of Personality and Social Psychology, 22*, 8-12.

Pennock-Román, M. (1984). Assortative marriage for physical characteristics in newlyweds. *American Journal of Physical Anthropology, 64*, 185-190.

Puhl, R. & Brownell, K. D. (2001). Bias, discrimination, and obesity. *Obesity Research, 9*, 788-805.

Regan, P. C., & Bersheid, E. (1997). Gender differences in characteristics desired in a potential sexual and marriage partner. *Journal of Psychology and Human Sexuality, 9*, 25-37.

Regan, P. C., & Anapuma, J. (2003). Ideal partner preferences among adolescents. *Social Behavior and Personality, 31*(1), 13-20.

Regan, P. C., Levin, L., Sprecher, S., Christopher, F.S., & Cate, R. (2000). Partner preferences: What characteristics do men and women desire in their short-term sexual and long-term romantic partners? *Journal of Psychology and Human Sexuality, 12*(3), 1-21.

Silventoinen, K., Kaprio, J., Lahelma, E., Viken, R. J., & Rose, R. J. (2003). Assortative mating by body height and BMI: Finnish twins and their spouses. *American Journal of Human Biology, 15*, 620-627.

Singh, D. & Young, R. K. (1995). Body weight, waist-to-hip ratio, breasts, and hips: Role in judgments of female attractiveness and desirability for relationships. *Ethology and Sociobiology, 16*, 483-507.

Sobal, J. (2005). Social consequences of weight bias by partners, friends, and strangers. In K. D. Brownell, R. M. Puhl, M. B. Schwartz, & L. Rudd (Eds.), *Weight Bias: Nature, Consequences, and Remedies* (pp. 150- 164). New York: The Guilford Press.

Sobal, J., Rauschenbach, B., & Frongillo, E. A. (2003). Marital status changes and body weight changes: A U.S. longitudinal analysis. *Social Science and Medicine, 56*, 1543-1555.

The, N., & Gordon-Larsen, P. (2009). Entry in to romantic partnership is associated with obesity. *Obesity*, doi:10.1038/oby.2009.97.

Upton, Graham J. 1991. "The Exploratory Analysis of Survey Data Using Log-Linear Models." *The Statistician 40*(2),169-182.

White, G. L. (1980). Physical attractiveness and courtship progress. *Journal of Personality and Social Psychology, 39*, 660-668.

World Health Organization. (1997). Obesity: Preventing and managing the global epidemic. Geneva: World Health Organization.

CHAPTER 2: ASSORTATIVE MATING FOR BMI: NEW EVIDENCE FROM MULTILEVEL AND FIXED-EFFECTS MODELS

Abstract

The study examines assortative mating for BMI in a sample of low-income married couples using the Marital and Relationship Survey (*N* = 371 couples). Marking a departure from previous research, the study estimates spousal differences in BMI and provides empirical benchmarks for spousal BMI differences among low-income married couples with coresident minor children, and wives age 15-44. Mechanisms for BMI dissimilarity are reviewed and a female-thinner norm is proposed. After adjusting for measures of social homogamy and convergence, interspousal BMI correlations show significant and positive associations between spouses' BMI ($r = .267$; $p < .0001$). Multilevel analyses reveal wives tend to outweigh husbands by about 5 BMI units. Social homogamy explained only 2% of the within-couple variance in BMI, as did convergence. Health concordance accounted for some of the positive association between spouse BMI. Fixed effects models that controlled for unobserved heterogeneity within couples revealed overall BMI similarity; differences were significant but not large with wives outweighing husbands by about 1 BMI unit ($\beta = -1.22$; $p < .05$). These results suggest that studies that do not control for omitted variable bias may understate active positive assortment for BMI. Overall results do not consistently support the hypothesis of the female-thinner norm. Models run separately by education and weight status show spouses with higher education select mates based on the female-thinner norm and wives with BMIs in the recommended weight range have significantly heavier husbands.

Introduction

Despite the saying that "opposites attract," positive assortative mating for body weight is well established. Previous research documents significant and positive interspousal correlations for body weight across a variety of populations and using various measures of weight, fatness, and fat distribution. For example, positive assortative mating for body mass index (BMI) has been found among engaged couples (r = .13) (Allison, Neale, Kezis, Alfonso, Heshka, & Heymfield, 1996), California newlyweds (r = .25) (Pennock-Román, 1984), British spouses (r = .12) (Mascie-Taylor, 1984), Finnish twins and their spouses (r = .19 to .25) (Silventoinen Kaprio, Lahaelma, Viken, & Rose, 2003), Swedish couples (r = .18) (Jacobson, Torgerson, Sjöström, & Bouchard, 2007), Minneapolis workers and their spouses (r = .12 for men and .14 for women) (Jeffery & Rick, 2002), Basque spouses (r = .07) (Salces, Rebato, & Susanne, 2004), and among Canadians (r = .14) (Katzmarzyk, Hebebrand, & Bouchard, 2002). Significant concordance has also been found for fatness and fat distribution using dual-energy X-ray absorptiometry (DEXA) (Speakman, Djafarian, Stewart, & Jackson, 2007), subcutaneous adiposity (e.g., skinfold measurements), body circumference measurements, centripetal fat ratio, and somatotype (Salces et al., 2004). Some research shows BMI resemblance to be U-shaped; interspousal correlations are strongest at the extremes of the BMI distribution (Jacobson et al., 2007) particularly at the highest percentile of BMI distribution (Katzmarzyk et al., 2002). The implications of previous research are clear: Married spouses – particularly obese spouses – tend to resemble one another in relative weight and body composition.[5]

Whether individuals actively select same-BMI spouses or whether observed

[5] Only a handful of studies have failed to find such an association (e.g., Sanchez-Andres & Mesa, 1994). For reviews of assortative mating for weight, see Spuhler (1968), Allison et al. (1996) Maes, Neale, & Eaves (1997), and Grilo & Pogue-Geile (1991).

resemblance in spouse BMI is a spurious result of passive matching processes has yet to be adequately addressed by researchers. For example, spousal BMI resemblance may reflect social homogamy – the tendency for individuals to marry partners of similar age, race-ethnicity, and socioeconomic background (Kalmijn, 1991). Alternatively, BMI resemblance may result from convergence due to sharing a common environment or intermate influence (e.g., a "cohabitation effect"). Most previous studies of assortative mating for BMI fail to control for both of these confounding factors, if any (for an exception see Silventoinen et al., 2003). Consequently, previous reports of spousal BMI concordance may be overestimated. A central goal of this study is to estimate the degree to which spouses resemble one another in BMI while statistically adjusting for effects of social homogamy or convergence.

Previous studies are also limited by their ubiquitous focus on matching. Mechanisms that may operate to produce BMI heterogamy are notably absent from the literature. A second goal of this study is to review these mechanisms, propose a female-thinner norm, and generate hypotheses about spousal BMI differences.

A final goal of this study is to provide empirical benchmarks of actual differences (if any) in spousal BMI. The main method for inferring assortative mating is to examine interspousal BMI correlations. Correlation coefficients describe linear association in a population but leave unanswered important questions about actual spousal differences. How different are spouses' BMI scores? Do BMI differences (if any) vary by the weight status of the husband, wife, or couple? Are husbands, on average, relatively heavier than their wives, or vise versa? These are several of the questions this study seeks to address.

The current study applies multilevel modeling to dyadic data from 371 low-income married couples in the Marital and Relationship Survey (MARS). Multilevel modeling, or hierarchical linear modeling (HLM), is appropriate for answering questions about spousal differences in BMI while addressing issues particular to dyadic data; namely that spousal data may violate OLS assumptions of nonindependence. HLM also permits analysis of within- and between-couple variance in BMI to make inferences about spousal resemblance in BMI. The current study also addresses whether unobserved heterogeneity bias may be an important issue for assortative mating researchers. Couple fixed effects models (FE) control for all possible factors that are common to both spouses in a couple that may confound estimates of BMI similarity due to active partner selection.

The degree to which spouses resemble one another in body mass has garnered attention by researchers who claim that assortative mating for obesity may be an important contributor to the obesity epidemic (Hebebrand et al., 2000; Jacobson et al, 2007; Speakman et al., 2007). Obese individuals tend to select other obese individuals as spouses and, consequently, pass on to their children a "double dose" of genes that compound predispositions to be overweight (Speakman, et al., 2007). Assortative mating for obesity also has consequences for long-term social inequality. Obesity is negatively associated with education (Gortmaker, Must, Perrin, Sobol, & Deitz, 1993) and wages (Cawley, 2004). Families with obese concordant parents may experience higher levels of poverty and have fewer health resources than families with obese discordant or non-obese concordant parents. Obese spouses may suffer from debilitating illness or disability that makes caring for the other difficult. This may lead to family stress, unemployment, and loss of income. Further, it may lead to the inability to parent and care for children. Understanding the mechanisms that may operate to produce spousal concordance (or discordance) in BMI is critical for shaping health interventions as well as for targeting health policy efforts.

Moreover, understanding assortative mating mechanisms also has implications for explaining societal differentiation and openness. Body weight is a social construct and obesity is a stigmatized condition (Sobal, 2005). Identifying patterns of spousal similarity and dissimilarity in BMI provides information about a society's norms about appropriateness and acceptance of obesity. Mechanisms that may produce BMI similarity as well as dissimilarity are reviewed below.

Explanations for BMI Similarity

Active Partner Selection

Assortative mating refers to the nonrandom partnering of spouses. In many cases, as in this study, assortative mating refers to *active* parter selection – that is, the deliberate selection of a spouse based on specifically preferred characteristics. Positive assortative mating for BMI (spousal BMI similarity) may result from two distinct processes: actual preference for similarity, or market sorting. The preference for a spouse with similar BMI can be explained by equity theory (Walster, Berscheid, & Walster, 1976); individuals avoid perceived inequity by actively selecting partners who are similar to themselves in body mass (Schafer & Keith, 1990). Perceptions of inequity can arise from a culture's norms of what is acceptable in terms of how well marital partners are matched on certain characteristics. Americans tend to believe that individuals should prefer similarly attractive partners (Kalick & Hamilton, 1986; Schafer & Keith, 1990). A dissimilar couple may raise speculation by onlookers who may closely examine both spouses' characteristics when making evaluations about either of the spouses (Bar-Tal & Saxe, 1976). Because obesity is a stigmatized condition (Puhl & Brownell, 2001; Sobal, 2005), dissimilarity in spouses' body mass may be seen as especially speculative.[6] Consequently, norms of appropriateness and perceptions of equity may operate to encourage individuals to prefer and seek partners

[6] Certainly, perceptions of what is acceptable in terms of body weight vary by gender and race-ethnicity in the U.S. It is therefore possible there exists greater acceptance of spouses' size differences among couples of different race-ethnicities compared to white couples. This will be discussed further below.

of similar BMI. These norms may be especially salient at lower levels of BMI; spousal BMI differences may be more easily detected (and thus able to be scrutinized) at lower levels of couple BMI and may matter less among obese couples who may already be regarded as deviant. Whether obese spouses have more or less similar BMI in terms of difference scores has yet to be established in the literature.

It is also possible that spousal BMI similarity may result from open competition in a mating market in which individuals vie for the most attractive partner possible (i.e., not a partner of similar attractiveness). Preference for a physically attractive partner is well documented (Shackelford, Schmitt, & Buss, 2005). Because body weight is associated with attractiveness, the mating market analogy presumes that as individuals seek physically attractive partners in the mating market, leaner (i.e., more attractive) individuals pair off first, leaving overweight people to partner amongst themselves. In other words, active preference for physical attractiveness may generate positive interspousal correlations for BMI in a competitive mating market. Alternatively, individuals may seek partners with the highest possible value on certain characteristics that are less readily observable (e.g., kindness, honesty, desire for children, ambition) and for which BMI may serve as a signal. Thus, open competition for such values may lead to positive assortment for BMI.

A central goal of this study is to estimate the effect of active assortment on spouse BMI. This effect may be confounded by several passive selection processes that operate to produce spousal similarity in BMI. These include social homogamy, convergence, and selective attrition which are described below.

Social Homogamy

The first passive process is social homogamy. Social homogamy refers to the tendency to resemble one's spouse in age, race-ethnicity, or socioeconomic status due to social and spatial constraints. Individuals tend to meet, develop social relations with, and subsequently develop romantic relationships with individuals from their own social milieu or geographical area such as schools, neighborhoods, bars, gyms, or the workplace. These social and geographic contexts serve as "local marriage markets" (Kalmijn, 1998; p. 403) and tend to be socially segregated and homogeneous in terms of sociodemographic and economic characteristics. Thus, they act to sort individuals on characteristics that affect mate selection. Considerable research shows that married spouses are matched on a variety of characteristics including age, race, and socioeconomic status (Kalmijn, 1991). To the extent that BMI is associated with each of these characteristics, then social homogamy will upwardly bias the spousal BMI correlation.[7]

Few previous studies have controlled for the effects of social homogamy on spouses' weight similarity, and mixed results are reported. Speakman et al. (2007) found no evidence of social homogamy with respect to obesity; controlling for social homogamy (area of origin using postal codes) had a small but non-significant effect on the interspousal correlations for lean and fat mass measured using DEXA. Similarly, Mascie-Taylor (1987) statistically controlled for social homogamy using spouses' region of birth, education, age, and social class (based on occupation) and found no effect on the interspousal weight correlation. However, using factor/delta path analysis, Silventoinen et al. (2003) showed that social homogamy had a stronger effect on BMI similarity than did active assortment for BMI. Thus, the effect of social homogamy on spousal BMI correlations is currently unresolved.

Convergence

Another mechanism through which BMI similarity can occur is via a

[7] The current study uses data on low-income couples. An inverse association between BMI and socioeconomic status has been consistently documented among women living industrialized countries; among men, the relationship is less consistent (Sobal, 1991; Sobal & Stunkard, 1989). Therefore, it's less clear how social homogamy may bias the similarity estimate. Regardless, controlling for social homogamy is necessary to net out effects of propinquity on active assortative mating for weight.

cohabitation effect which assumes spouses converge in weight over time due to sharing a common living environment and intermate influence. The basic assumption underlying this explanation is that once spouses move in together, they spend more time together, engage in common lifestyle activities, and share resources, a physical environment, and social networks (Bove, Sobal, & Rauschenbach, 2003; Smith & Zick, 1994). This sharing of resources is presumed to lead to spousal similarity in health-related behaviors and in measures of health status such as BMI. Role theory may also provide an explanation: the role of spouse, particularly for wives, may involve indirect and direct monitoring and regulating of the other spouse's health-behavior (Umberson, 1987) which, in turn, may lead to convergence in behaviors and health. Though pregnancy and childbirth may affect wives' weight more than husbands, parenting roles may produce convergence since parenting is associated with dietary changes, changes in lifestyle, and reduced time for physical activity among married spouses. Weng et al. (2004) showed that number of children is associated with obesity for *both* women and men. Not surprisingly, Meyler, Stimpson and Peak's (2007) review the literature on health concordance in couples found evidence of concordance for mental health, physical health, and lifestyle factors such as dietary intake, smoking, alcohol consumption, and illicit drug use. Homish and Leonard (2008) found that individuals' premarital health behaviors, such as exercise and healthy eating, were associated with their spouses' health behaviors over the first four years of marriage. If studies of assortative mating for BMI fail to control for convergence effects, then estimates of active assortment effects may be overstated.

Support for the convergence hypothesis is mixed. Jeffery and Rick (2002) used longitudinal data to show spouse BMI covaried significantly over a two year period, indicating that shared environment is at least partially responsible for similarity in weight change among spouses. Jacobsen et al. (2007) compared interspousal BMI correlations among spouses who varied by duration of cohabitation and found correlations were strongest among couples with the shortest duration of cohabitation indicating an assortment, rather than a convergence, effect. Speakman et al. (2007) found couples actually diverged in body fatness with length of cohabitation although the change was not significant. Grilo and Pogue-Geile (1991) extensively reviewed the literature on the effect of environmental influences on weight and obesity and found no consistent evidence that weight-related spousal correlations were larger for cohabiting couples than for noncohabiting couples. They concluded there exists no evidence of an environmental effect on spousal weight. Of course, it is possible that convergence occurs entirely or primarily during courtship and those early effects of shared behaviors, resources, and activities remain undetected in later analyses. In this case, spousal similarity in BMI due to active assortment will be overestimated.[8] Despite their conclusion, Grilo and Pogue-Geile argue "designs that evaluate duration of cohabitation are necessary" (p. 526) to distinguish active assortment versus environmental effects on spousal BMI similarity.

Selective Attrition

A final mechanism that may help explain the observed correlation in married spouses' BMI scores is selective attrition. For example, if couples with incongruent BMI scores are more likely to divorce, then remaining couples will be more similar in terms of BMI and correlation analyses will be upwardly biased. Restricting analytic samples to young couples (i.e., couples aged 18 – 34) may reduce such bias assuming the age restriction limits the sample to recently-married couples in first marriages, thus minimizing any potential selection bias caused by marital disruption and remarriage.[9] However, this restriction may underestimate levels of BMI similarity if men and

[8] Ideally, one needs longitudinal data that was collected at the beginning of courtship and follows couples through cohabitation and marriage.
[9] This is a common technique used in studies of assortative mating for race-ethnicity (e.g., see Lichter, Carmalt, & Qian, 2009).

women who first marry at older ages are more likely to marry spouses with similar BMI. Perhaps reassuringly, similarity estimates among engaged couples prior to marriage and cohabitation (Allison et al., 1996) and among newlywed couples (Pennock-Roman, 1984) are largely similar to those found in long-standing marriages. Furthermore, Allison and colleagues demonstrated that mate similarity prior to marriage did not predict marriage survival 20 years later. Pennock-Roman concludes "the effects of cohabitation or attrition through divorce are probably trivially small" (p. 187).

Explanations for BMI Dissimilarity

Most previous studies of assortative mating for weight, focus solely on mechanisms that produce spousal BMI similarity. The ubiquitous focus on matching in the current literature ignores several mechanisms that may operate to produce BMI dissimilarity, or heterogamy, among spouses. These mechanisms and their hypothesized effect on spouses' relative weight are reviewed here.

Active Assortment and Social Exchange

Mate market exchange models (e.g., Becker, 1976; England & Farkas, 1986; Sprecher, 1998) emphasize the multiple different attributes (both desirable and undesirable) that men and women exchange in a relationship market in order to obtain the "best match" possible. This tends to result in an equilibrium wherein positive assortative mating for overall mate value – based on each spouse's "bundle" of tradable attributes – is observed despite marked differences between some of the characteristics making up the respective spouse's bundles (Carmalt, Cawley, Joyner, & Sobal, 2008). For example, if women trade physical attractiveness for men's socioeconomic status or, alternatively, men use their status to gain physically attractive mates, then BMI discordance may result.[10] In the U.S., women's attractiveness is negatively associated with BMI (Tovée, Reinhardt, Emery, & Cornelissen, 1998) whereas in men, the association between socioeconomic status and BMI tends to be curvilinear (Sobal, 1991; Sobal & Stunkard, 1989). Consequently, "matches" based on women's attractiveness and men's status may produce spousal BMI heterogamy. This association is evident in the current literature. Kurzban and Weeden (2005) used a speed dating experiment to show that as men's income increased, they tended to select women with BMIs leaner than their own. Several studies document the association between husbands' education and wives' BMI and fatness; women who "marry up" in terms of their husbands' education are leaner than wives who "marry down" (Garn, Sullivan, & Hawthorne, 1989a; 1989b; Lipowicz, 2003). Garn and colleagues (1989a) further showed that differences in spouse BMI decreased with increasing education of wives or husbands and that additional education beyond high school was associated with the fatness of husbands exceeding that of their wives. Thus, social exchanges in a mating market may produce BMI heterogamy; at the low end of the socioeconomic distribution, wives may outweigh their husbands, whereas at the high end of socioeconomic status, husbands may outweigh their wives.[11]

Assortative Mating for Physical Attractiveness

Considerable research documents positive assortative mating for physical attractiveness (Feingold, 1988; Stevens, Owens, & Schaefer, 1990). Matching for physical attractiveness is presumed to result from open competition in a mating market in which pursuit of the most attractive partner results in partners of similar levels of

---

[10] Likewise, differences in spouses' age, education, and race-ethnicity may be associated with differences in spouses' BMI.

[11] Due to the inverse association between status and BMI in women and an inconsistent or somewhat curvilinear association between status and BMI in men (Sobal, 1991; Sobal & Stunkard, 1989), I argue a similar outcome could be produced if couples sort positively on SES (e.g., if couples sort on SES similarity as opposed to BMI similarity).

attractiveness pairing off (Murstein, 1972). Criteria for physical attractiveness are different for women and men. In women, physical attractiveness is largely a function of body weight (Singh & Young, 1995; Tovée & Cornelissen, 2001). Women at the low end of what is considered to be "healthy weight" (e.g., a BMI of 20 in the range of 18.5 to 24.9) and who exhibit a somewhat curvaceous figure (i.e., have a waist-to-hip ratio of about .7) are considered optimally attractive (Tovée et al., 1998; Singh, 1993). Other research documents the importance of thinness in assessments of women's attractiveness (Garner, Garfinkel, & Schwartz, 1980; Polivy, Garner, & Garfinkel, 1986; Wiseman et al., 1992). Men's attractiveness, on the other hand, is largely a function of socioeconomic status (Singh, 1995). Though BMI is less important for assessments of men's attractiveness (Maissey et al., 1999; Singh, 1995), optimal BMI in men tends to range from 23 to 25 (Kurzban & Weeden, 2005; Maissey et al., 1999). Thus, as women and men actively sort on physical attractiveness in a mating market, it is possible that matching for physical attractiveness results in male-female differences in BMI wherein female partners are relatively leaner than their male partners.

Differential Stigmatization of Obesity

Considerable research shows that obese women are discriminated against in the marriage market to a greater extent than are obese men. Obese women are seen as less desirable dating partners (Sobal & Bursztyn, 1998; Sobal, Nicolopoulos, & Lee, 1995), date less frequently than do their healthy weight counterparts (Cawley, Joyner, & Sobal, 2006), and are less likely to marry (Averett & Korenman,1999; Mukhopadhyay, 2008). Obese white women face greater stigmatization than do obese black women, black men are more willing to date overweight women than are white men (Powell & Kahn, 1995) and obesity lowers the probability of marriage twice as much for white women than for black women (Averett & Korenman, 1999). Mukhopadhyay (2008) concludes that marriage may be a special form of union for women: Women are willing to marry obese men because they value other factors inherent in marriage (e.g., love, commitment, security, children), whereas men may be willing to forgo these factors in absence of an attractive partner. This suggests there may be an observed imbalance in the number of BMI discordant marriages in which the husband is relatively heavier than the wife. This could result in average spousal difference scores that are positive (husband BMI minus wife BMI).

Norms of Acceptable Heterogamy: Proposing a Female-Thinner Norm

Cultural norms about acceptable mate-pairing do not always operate to produce similarity among spouses. Several norms exist in the U.S. that produce acceptable heterogamy. The most obvious is the male-taller norm (Bersheid & Walster, 1974; Gillis & Avis, 1980). That a man should be as tall or taller than his female partner has been dubbed the "cardinal principal of dating" (Bersheid & Walster, 1974). On average, husbands tend to be about 6 inches taller than their wives (Gillis & Avis, 1980). The second (and arguably equally as obvious) norm relevant to human mate pairing is the female-younger norm (Green, Buchanan, & Heuer, 1984). Men tend to be about two years older than women at first marriage (U.S. Census Bureau, 2007) and fathers tend to be two years older than mothers (Landry & Forrest, 1995).[12] Couples who violate these norms may face considerable scrutiny.[13] Rauch

[12] Of course, age and height differences may be biologically advantageous; height in men is associated with characteristics that may signal their ability to care for his offspring such as dominance and status (Roberts & Herman, 1986), whereas youthfulness in women may signal reproductive potential. Alternatively, the norm may simply exist because the average American male is about 5-6 inches taller than the average American female (Hatfield & Sprecher, 1986).

[13] Consider, for example, the extreme scrutiny of and attention paid to Tom Cruise and Katie Holmes when they paired up (ignoring, for now, the media response to his bizarre performance on Oprah). Katie is 3 inches taller than Tom, and is 16 years his junior. Negative media response indicates they violated both the male-taller norm, and the female-younger norm (while indeed Katie is younger, there is a norm about how much younger is too much). Alternatively, consider the scrutiny couples Demi Moore and Ashton Kutcher (she is 15 years his senior) and Cameron Diaz and Justin Timberlake (she was 9 years his senior) received for violating the female-younger norm. Terms like "cougar" and "boy toys" seemed to have evolved from such recent pairings. Interestingly, cougars (women who date much younger men) seem to be perceived more negatively than do their boy toys. Likewise, men who date much younger women seem less stigmatized than women who date much younger men; compare, for

(2004) argues that what constitutes an acceptable match depends on the characteristic in question and that the media is largely responsible for developing current norms of acceptable pairing. Two social norms that are widely observable in the current popular media include the female-more attractive norm and the female-thinner norm. Walt Disney's movie Beauty and the Beast is a classic example of the female-more attractive norm.[14] Several television shows depict couples in which the wife is clearly more attractive than the husband (Everybody Loves Raymond, George Lopez); I am unaware of any current television shows depicting an attractive husband paired with a less attractive wife.[15] Additionally, celebrity pairings are rife with examples of couples who demonstrate this norm (Donald Trump and Melania Knauss, Rod Stewart and Penny Lancaster, Howard Stern and Beth Ostrosky). The female-thinner norm is also widely portrayed in the current media; a considerable number of television shows portray husband-wife pairings in which the husband is much heavier than the wife (King of Queen, Sopranos, According to Jim, Family Guy, The Simpsons).[16] Very few television shows exist that depict heavier wives, and when they do (e.g., the elderly parents in Everybody Loves Raymond) the wife is more often than not portrayed as an overbearing bully.[17] Turning to empirical evidence, a recent study by McNulty, Neff and Karney (2008) showed that relative attractiveness among newlyweds is associated with marital supportiveness and satisfaction: both husbands and wives behaved more positively and reported greater marital satisfaction when

---

example, perceptions of Hugh Hefner (he has multiple younger girlfriends and a television show about it) to Cher or Madonna. In sum, norms of appropriateness seem directional and to vary by gender.

[14] For an even more extreme example, consider King Kong and Ann Darrow.

[15] The new television show, Ugly Betty may serve as a first given Betty doesn't receive a makeover before she is deemed worthy of marriage to an attractive male.

[16] Some would argue the wives are also more attractive then their husbands, regardless of the husbands' weight.

[17] George and Louise Jefferson from The Jeffersons are another example. The Jeffersons also violated the male-taller norm. One could argue that norms vary by race-ethnicity and relative differences in spouse size may vary for black couples. In a recent season of Grey's Anatomy, a slender (and somewhat geeky) male doctor married an overweight (and highly attractive) female doctor: he was white and she Latina (they subsequently divorced and she began dating a woman).

wives were more attractive than their husbands. Empirical evidence for the female-thinner norm is given by Kurzban & Weeden (2005) who show that some men seek leaner, rather than same-BMI mates, indicating a preference for BMI heterogamy rather than homogamy.[18]

In sum, a female-thinner norm may operate in contemporary U.S. culture to produce BMI discordance among married spouses. Whether evidence of a female-thinner norm will operate in the current study is debatable given that the study subjects are low-income married couples. As empirical evidence may indicate (e.g., Garn et al., 1998a; Kurzban & Weeden, 2005), the female-thinner norm may only apply to individuals of higher socioeconomic status.

The Current Study

Using data from 371 married couples from the Marital and Relationship Survey (MARS), this study estimates assortative mating for BMI in a population-based sample of low-income couples. The study makes several contributions to the literature. First, interspousal BMI correlations are estimated in order to compare study results with the existing literature. Second, the study is the first to provide empirical benchmark estimates of spousal differences in BMI.[19] Hierarchical linear models (HLM) are estimated which simultaneously measure average spousal difference in BMI while decomposing variance in BMI into within- and between-couple variance. This study is the first to use variance component analysis to assess assortative mating for BMI. A high degree of assortative mating would suggest that most of the variation in BMI occurs between couples, rather than within couples. This study will test this hypothesis. Second, the study provides estimates of active partner selection for BMI by statistically adjusting for the effects of *both* social homogamy and convergence on

[18] Research on fat admirers (FAs) – individuals, typically heterosexual men, who are sexually attracted to heavier partners – also demonstrates preference for BMI heterogamy (Swami & Tovee, 2009). Gailey and Prohaska (2006) show that FAs are often seen as deviants for violating cultural norms.
[19] Garn et al. (1989a) produce spousal difference scores using skinfold measures of fatness.

BMI similarity. The study improves upon previous studies in two ways. Using HLM, I alternately add couple-level measures of social homogamy and convergence to the models and examine their effects on (a) the spousal difference score and (b) within-couple and between-couple variance in BMI to examine the degree to which social homogamy and/or convergence explain (if any) variance in BMI. Next, I employ couple fixed effects models (FE) which are presumed to address issues of endogeneity due to omitted variable bias and control for all factors common to both spouses in each couple that may be associated with BMI similarity. In theory, fixed effects regression should completely control for similarity due to social homogamy and convergence. Finally, this study departs from previous studies by addressing mechanisms for BMI discordance, or heterogamy, and by deriving and testing several hypotheses about spousal BMI differences.

This study addresses the following research questions:

1. Are low-income spouses' BMIs associated?
2. What is the mean BMI of low-income couples? How much variability exists in mean BMI?
3. What is the mean difference in spouse BMI among low-income couples? How much variability exists in spousal BMI differences?
4. How much variance in BMI exists within-couples compared to between-couples? Does social homogamy, convergence, both, or neither explain within-couple variance in BMI?
5. Do husbands tend to be heavier than their wives? Does this depend on the weight status of the husband or wife? Does it depend on the education of the husband or wife?
6. Does social homogamy or convergence explain similarities (or differences) in spousal BMI?

7. What is the mean difference in spouse BMI after controlling for unobserved heterogeneity?

Hypotheses

Hypothesis 1: Consistent with previous studies, spousal BMIs will be significantly and positively correlated. Controlling for social homogamy and convergence will each reduce the interspousal BMI correlations, indicating that both similarity in sociodemographic characteristics and a shared environment account for some of the similarity in spouses' BMI.

Hypothesis 2: After controlling for spousal BMI similarity due to social homogamy and convergence, significant differences will exist between spouses' BMI. Because the sample is restricted to low-income couples, wives will, on average, be heavier than their husbands. At lower ends of the BMI distribution, spouse BMI differences will be consistent with the female-thinner norm. As BMI increases, differences in spouse BMI will increase. At higher levels of education, differences will be consistent with the female-thinner norm. At higher levels of education, differences in spouse BMI will decrease.

Hypothesis 3: After controlling for all possible factors that are common to both couples (FE models), differences in spousal BMI will be strengthened. In other words, I hypothesize that previous estimates of active assortative mating for BMI are overstated and that controlling for all possible social homogamy and convergence-related factors will produce significant BMI differences. Evidence of the female-thinner norm will be especially evident among couples with higher education and lower BMI.

Method

Data

Data for this study come from the Marriage and Relationship Survey (MARS). MARS is a web-based survey of 433 low income married couples with co-resident minor children. The MARS survey was administered in 2006 by Knowledge Networks (KN), which maintains a nationally representative web-enabled panel of respondents who, in exchange for a computer, Internet appliance, web TV, and access to the internet, are expected several times a year to participate in online surveys for KN. Because Internet accessibility is provided for panelists, the use of an Internet survey does not exclude members with disadvantaged backgrounds who are least likely to not own a computer or have access to the Internet. Panelists receive a unique login and password to ensure confidentiality of responses.

The MARS sample was selected from the KN panel of respondents and was restricted to couples with co-resident minor children, with household incomes of less than $50,000, and in which the wife was age 15-44. Information was collected separately from both spouses, in separate survey sessions, and took each spouse approximately 35-40 minutes to complete. To ensure privacy, each spouse maintains a separate login and password. The MARS response rate was 80.3% and item non-response was low (less than 4%).

Analytic Sample and Addressing Missing Data

For this study, the analytic sample was limited to couples in which both spouses had valid data about both height and weight that was used to calculate BMI. A total of 395 couples (91% of the sample of couples) provided information about their own height and weight. Two couples were deleted in which one spouse reported an implausible height (height greater than 8 feet). Because body weight is affected by current pregnancy, 21 couples were eliminated in which either the husband or wife or both reported the wife was currently pregnant or expecting a baby.

This left an analytic sample with very little missing data on the variables selected for analysis (N = 374 couples). This means that there were not enough variables with missing information to employ multiple imputation, even after selecting auxiliary variables to help with the imputation process (Allison, 2002; 2007). Furthermore, of the variables that did have missing information each was a variable that was theoretically invariant between spouses in the same couple (e.g., duration of relationship, cohabitation status, and hours spent together during a typical week).[20] Thus, missing data were handled in the following way. First, if only one spouse in a couple was missing information on the couple-level variable, the other spouse's value for the variable was substituted. Second, if both spouses were missing information on the couple-level variable, then the couple was deleted from the analytical sample. Following spouse-substitution, 3 couples remained with missing information about cohabitation status (e.g., whether they cohabited before marriage) and were deleted. This process resulted in an analytic sample of 371 married couples (742 spouses).

Statistical Analysis Plan

Hierarchical linear modeling (HLM) using maximum likelihood (ML) was used to analyze the association between spouses' BMI scores.[21] HLM is appropriate for the analysis of dyadic (i.e., couple-level) data because dyadic data represent a

---

[20] Of couples who did not cohabit before marriage, 4 wives and 2 husbands had missing information on variables used to calculate duration of cohabitation (interview date minus marriage date). Of couples who did cohabit before marriage, 16 wives and 16 husbands had missing information on variables used to calculate duration of cohabitation (interview date minus date couple first moved in together). Two wives and 8 husbands were missing information about number of hours spent together in a typical week.

[21] REML is generally preferred over ML because it adjusts the degrees of freedom in estimates of the random effects and they are therefore less biased (Allison, 2008). However, model fit statistics (e.g., deviance scores) cannot be compared between two nested models when using REML. The difference in the two methods is equivalent to using n versus n-1 in the denominator for the sample variance. All models were computed using both REML and ML producing only very little difference in the standard error and z-statistic on the random effects. Thus, in order to be able to compare fit across nested models, ML results are reported.

special case of hierarchically structured data where spouses (Level 1) are nested within couples (Level 2) (Bryk & Raudenbush, 1992). Observations about spouses nested within the same couple are likely to be interdependent. Spousal dependence violates standard OLS regression assumptions of nonindependence of observations and leads to inefficient estimation, inaccurate test statistics, and biased significance tests (Cook & Kenny, 2005). HLM relaxes the independence assumption, allows for correlated error structures (Luke, 2004), and allows the researcher to measure and test interdependence while incorporating it into the model by treating interdependence as a variance and not a correlation (Kenny, Kashy, & Cook, 2006). Importantly, HLM partitions the total variance in BMI into within- and between-couple variance, and allows couple-level predictor variables to be included at Level 2 to explain this variance.

In this study, individual spouse BMI was modeled at Level 1 as a linear function of couple-level measures of social homogamy and convergence at Level 2. Data were organized in "long form" so that for every dyad (the unit of analysis), there was a record for both the husband and the wife. The data include an ID variable that is identical for each spouse in a couple, and a spousal indicator that indicates from which spouse (the husband or wife) the data record came. Table 2.1 provides an example of how the data for four couples were organized for this study.

The first variable is the dyad identification number represented by the household ID number (HHID). PERSON is the second variable that shows the nested structure of the data with exactly two persons included in each household. The third variable is a spousal indicator (GENDER) that is coded -.5 for wives and +.5 for husbands. The spousal indicator is the variable of interest in this study. Incorporation of a spousal indicator creates intercept and slope parameters for BMI at Level 1. "Centering" the spousal indicator in this fashion is useful for interpreting the intercept and slope in the multilevel model: The intercept represents average couple BMI and the coefficient on the spousal indicator represents the difference in BMI between husbands and wives. The sign of the coefficient on the spousal indicator identifies whether husbands (a positive coefficient) or wives (a negative coefficient) are heavier on average. The fourth variable shown in Table 2.1 is the dependent variable, BMI. BMI is an individual-level variable which varies both within and across couples. Two couple-level independent variables are also shown: a measure of the couple's mean age in years (COUPAGE), and a measure of within-couple difference in spouse age (husband minus wife; AGEDIF). The Level 2 predictor variables are common to each couple and vary only across couples. Operationalization of each of the variables used in this study is described in more detail below.

Table 2.1. Example of Data Structure for HLM Analysis of Dyadic Data.

HHID	PERSON	GENDER	BMI	COUPAGE	AGEDIF
1	1	-.5	31.80	39	-4
1	2	+.5	48.95	39	-4
2	1	-.5	18.11	43.5	5
2	2	+.5	22.13	43.5	5
3	1	-.5	41.24	40.5	1
3	2	+.5	26.51	40.5	1
4	1	-.5	28.60	44	0
4	2	+.5	31.96	44	0

Note: Data come from the Marital and Relationship Survey (MARS).

Multilevel Model Specification

Unconditional Means Model

The first step in a multilevel analysis of dyadic data is to compute an unconditional means model in which only the spousal indicator (GENDER) is included as a predictor at Level 1. Computing the unconditional model allows the researcher to determine whether it is necessary to model the covariance structure in the data (e.g., the observations are dependent) using a multilevel approach (Campbell & Kashy, 2002). Furthermore, the unconditional model provides baseline estimates of within- and between-couple variance in BMI. Note the subscript j on the Level-1 intercept (β_{0j}) and slope (β_{1j}). This indicates that a separate Level-1 regression equation is computed for each of the j couples, which allows the within-couple BMI relationship to be summarized by a unique intercept and slope for each couple. The unconditional Level-1 model is:

$$BMI_{ij} = \beta_{0j} + \beta_{1j}G_{ij} + r_{ij} \tag{1.0}$$

where G represents gender, the intercept, β_{0j}, represents the average BMI for couple j, the slope, β_{1j}, represents the average spousal difference in BMI for couple j, and r_{ij} represents the within-dyad residuals or Level 1 random error associated with the i^{th} spouse in the j^{th} couple (e.g., unexplained variance). These residuals are assumed to be normally distributed with a mean of 0 and a constant variance, σ^2.

At Level 2, the intercepts and slopes from the Level 1 equation are treated as dependent variables and can be decomposed into their fixed and random components. Each is allowed to vary across all couples and can take on different values for each couple. The Level 2 unconditional models provide estimates of the population averages for each Level 1 parameter – the intercept and the slope. The fixed effects represent the means of the distribution of the respective coefficients (e.g., the intercepts and the slopes) across couples. The Level 2 random effects represent the deviation of each couple from the respective population average parameter. One limitation of conducting HLM analysis with dyadic data is the inability to estimate random effects for both the intercepts and slopes simultaneously (Newsom, 2002). This is because dyads do not have enough Level 1 units (e.g., there are only 2 spouses per dyad) to allow the slopes to vary from dyad to dyad (Kenny, Kashy, & Cook, 2006). Thus, the Level 2 slope coefficient is constrained to be fixed across clusters. In other words, the slopes are permitted to vary from couple to couple, but their variation is nonrandom (Bryk & Raudenbush, 1992). There are two Level 2 equations in the unconditional means model:

$$\beta_{0j} = \gamma_{00} + u_{0j} \tag{1.2}$$

$$\beta_{1j} = \gamma_{10} \tag{1.3}$$

where γ_{00} (the Level-2 intercept) represents the average BMI for the population of couples (grand mean BMI) and u_{0j} represents the unique effect of couple j on average BMI. Random effect u_{0j} is assumed to be normally distributed with a mean of 0, constant variance, τ_{00}, and uncorrelated with G and r_{ij}. γ_{10} is the parameter of interest in this study: This slope parameter estimates the average BMI discrepancy between husbands and wives in the population of couples and tests the null hypothesis that husbands and wives have the same BMI scores (e.g., evidence of BMI similarity). Furthermore, the sign of the coefficient tests the hypothesis of the female-thinner norm (e.g., a positive coefficient).

The combined form of the unconditional model is then:

$$BMI_{ij} = \gamma_{00} + \gamma_{10}G_{ij} + u_{0j} + r_{ij} \tag{1.4}$$

where the first two terms on the right side of the equals sign show the model's fixed effects and the second two terms show the model's random effects. The combined form of any multilevel model is frequently called the *mixed effects model* because it is composed of both fixed and random components.

Variance Component Analysis

Variance components of the random effects can be estimated from the mixed model and used to produce estimates of between-couple heterogeneity in BMI. For the random intercepts model described in Equation 1.4 above, there are two variance components: τ_{00} which is the unconditional variance in the couple means (Level 1 intercepts), and σ^2 which is the Level 1 residuals. Both are assumed to be normally distributed with a mean of 0. The intraclass correlation (ICC or ρ) is calculated from the unconditional variance components to provide an estimate of the proportion of variance in BMI occurring between couples. Frequently, the ICC is used as a diagnostic to justify the use of a multilevel approach (Bryk & Raudenbush, 1992; Kenny, Kashy, & Cook, 2006; Luke, 2004). The ICC provides a measure of the extent to which observations within a couple are related as expressed by the ratio of the between-couple variance to the total variance as follows:

$$\rho = \tau_{00}/(\sigma^2 + \tau_{00}) \qquad (2.0)$$

A relatively large ICC indicates that BMI scores are clustered within couples; in other words, spouses' BMI scores in the same couple are dependent. This study is primarily concerned with within-couple heterogeneity in BMI. Subtracting the ICC from 1 provides an estimate of the proportion of variance in BMI occurring within couples. When a variance component is significantly different from zero in the population, then significant heterogeneity in BMI exists to be explained. In dyadic data analysis, this is done by adding predictor variables to the Level 2 equations.

Conditional Multilevel Models: Conditional Random Intercept Models

The next step in a multilevel analysis involves adding predictor variables to the model in order to explain variance in the unconditional model's slopes and intercepts. For this analysis, couple-level covariates are added to the Level 2 regression equations in order to statistically control for the effect of social homogamy and convergence on the Level 1 intercepts and slopes. A primary goal of this study is to measure the proportion of within-couple variance in BMI (1-ICC) remaining after controlling for social homogamy and convergence and also to test for a significant difference in spouse BMI (γ_{10}), or any other change in the direction or magnitude of γ_{10} after controlling for any similarity in BMI due to social homogamy and convergence.

Three different conditional models were specified. First, a vector of social homogamy predictors was added to the Level 2 models. Second, a vector of convergence predictors was added to the Level 2 models. Third, a model was estimated that included both the social homogamy and convergence predictors. The conditional system of equations with predictor variables at Level 2 can be represented as:

Level 1:

$$BMI_{ij} = \beta_{0j} + \beta_{1j}G_{ij} + r_{ij} \qquad (3.0)$$

Level 2:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}W_j + u_{0j} \qquad (3.1)$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}D_j + \gamma_{12}W_j \qquad (3.2)$$

Combined:

$$BMI_{ij} = \gamma_{00} + \gamma_{01}W_j + \gamma_{10}G_{ij} + \gamma_{11}D_jG_{ij} + \gamma_{12}W_jG_{ij} + u_{0j} + r_{ij} \qquad (3.3)$$

where *G* is the spousal indicator (GENDER), *W* is a vector of social homogamy and convergence characteristics that take on the mean value of the couple and *D* is a vector of social homogamy characteristics that are operationalized as a set of spousal difference scores (husband minus wife). *W* is presumed to affect mean couple BMI and is included in the Level 2 intercept equation (Equation 3.1).[22] *D* is presumed to affect the difference in spouses' BMI scores and is included in the Level 2 slope equation (Equation 3.2).[23] As with the unconditional model, only the intercepts are permitted to vary randomly. Slopes are permitted to vary strictly as a function of *D* and *W* but with no additional random component. In the conditional random intercepts model, γ_{00} is no longer the grand mean BMI in the population of couples, but instead represents the expected value of BMI when the predictor values are all 0. γ_{10} represents spousal BMI discrepancy after taking into account social homogamy

[22] For example, older couples, on average, should be heavier.
[23] For example, differences in education may be associated with differences in BMI.

and convergence. Variance components are also conditional: representing the variability in β_{0j} and β_{1j} remaining after controlling for social homogamy and convergence. Details about the variables used in the model are specified below.

Variable Definitions

Dependent Variable

The dependent variable is body mass index (BMI) defined as weight in kilograms divided by height in meters, squared. The inadequacies of BMI as an accurate measure of adiposity are well documented (e.g., Cawley & Burkhauser, 2006) however it is the only measure available for use in the MARS. Weight and height are self-reported, thus, all BMI values were corrected for reporting error following Cawley and Burkhauser (2006).[24] For descriptive purposes, husbands and wives were classified as obese (BMI ≥ 30), overweight (30 > BMI ≥ 25), healthy weight (25 > BMI ≥ 18.5) or underweight (BMI < 18.5) using the World Health Organization cutoffs (1997).

Social Homogamy Variables

In this study, social homogamy was measured using pairs of couple-mean scores and spouse-difference scores. For each characteristic, couple-mean scores were calculated by summing the score of the husband and wife and dividing by 2, for each couple. Difference scores for each characteristic were calculated by subtracting the wife's score from the husband's score for each couple. A difference score of 0 indicates a husband and wife dyad is identical on that characteristic (e.g., homogamous). A positive difference score indicates the husband has a higher value on the characteristic, whereas a negative difference score indicates the wife has a higher value on the characteristic. Couple mean and difference scores were created

[24] The Cawley and Burkhauser (2006) correction estimates only pertain to non-Hispanic black, non-Hispanic white, and Hispanic individuals. Thus, corrections were only made for individuals in the MARS data who self-identified as one of these three race-ethnicities. All others spouses' BMI values (4% of the sample) remain uncorrected.

for age in years (COUPAGE, AGEDIF) and education according to highest degree received (COUPED, EDDIF).[25] Because differences in spouse race-ethnicity cannot be meaningfully averaged or differenced, race-ethnic homogamy (HOMRACE), was measured using a dummy variable that equaled 1 if spouses in the same couple reported the same race-ethnicity (non-Hispanic white, non-Hispanic black, non-Hispanic Other, Hispanic (any race), and two-plus races (non-Hispanic)), else 0. Spouses in the same couple have identical scores for each of the above measures.

Convergence Variables

Several variables were created to control for spousal similarity in BMI due to sharing a common living environment and interspousal influence. Duration of cohabitation (COUPDUR) was measured in months. For couples who cohabited before marriage, duration of cohabitation was measured using interview date in months minus date of first moving in together in months. For couples who did not cohabit before marriage, duration of cohabitation was measured using interview date in months minus date of marriage in months.[26] Cohabitation status (COHAB) is a dummy variable that equals 1 if either of the spouses in a couple (or both) reported they cohabited together before marriage, else 0.[27] Reports of the number of hours each couple spends together on an average weekday and weekend excluding when they are asleep (COUPTOG), were summed and entered numerically.[28] Number of wives biological children (COUPKIDS) is the average number of biological children reported by the wife in each couple.[29] Spouses in the same couple have identical

---

[25] Education as highest degree received was recorded in 8 categories: less than high school (0); some high school, no diploma (1); graduated from high school (2); some college, no degree (3); associate degree (4); bachelor's degree (5); master's degree (6); professional degree (MD, DDS, LLB, JD) or doctorate degree (7).

[26] 16% of couples differed on this variable (+/- 4 months), thus, the couple-average duration was used.

[27] 4% of spouses differed on their report of cohabitation status and so were coded 1.

[28] 22% of couples differed on this variable (+/- 7 hours), thus the couple-average number of hours was used.

[29] Results do not change whether I use number of number of husband's biological children or the average of husbands' and wives' children for couples who vary on this characteristic.

scores on each of these measures.

Centering

Centering several predictor variables is useful for interpreting the intercept in the multilevel model. For example, without centering, then γ_{10} in Equation 3.3 represents the average difference in spousal BMI in the population of couples when all other couple-level characteristics equal 0. For some variables, such as age, a value of 0 does not provide meaningful interpretation. For other variables, such as race-ethnic homogamy or difference in spousal education, a value of 0 is meaningful (e.g., the couple is race-ethnic heterogamous or is identical in education, respectively). A value of 0 on duration of cohabitation and time spent together during the week is theoretically meaningful in this study since a goal is to estimate differences in spousal BMI while statistically controlling for convergence effects. Thus, only the following variables were centered about the grand mean: couple-mean age (COUPAGEc) and wife's number of biological children (COUPKIDSc). When these variables are centered then γ_{10} in Equation 3.3 represents the average difference in spousal BMI in the population of couples for race-ethnically homogamous couples who are average in the population on age and number of biological children, have a high school education or less, are identical in age and education, did not cohabit before marriage, have lived together for 0 months, and spend no time together weekly.

Fixed Effects Model Specification

It is possible that the hierarchical models above suffer from endogeneity due to omitted variable bias if factors on which spouses sort that are also associated with BMI are omitted from the models. If I assume that unobserved factors are stable, or common, between spouses (e.g., shared meals, shared home conditions and income, common background characteristics and experiences, shared health behavior such as smoking and exercise habits, and common health problems), treating spouses as repeated observations in a pooled cross-section of couples allows me to exploit within-couple variation in age, education, and race-ethnicity and "net out" any common unobservable factors that may bias estimates of BMI similarity. It is assumed that by controlling for all factors common to both spouses in each couple, the fixed effects strategy removes all effects of social homogamy and convergence on spousal BMI similarity, reduces omitted variable bias, and produces an estimate of spousal BMI association due to active physical assortment.

For a dyadic model with two spouses per couple, fixed effects regression can be accomplished using OLS regression and taking differences between spouses.[30] The equations for the two spouses are:

$$BMI_{i\mathrm{H}} = \mu_{\mathrm{H}} + \beta X_{i\mathrm{H}} + \gamma Z_i + \alpha_i + r_{i\mathrm{H}} \quad (4.0)$$

$$BMI_{i\mathrm{W}} = \mu_{\mathrm{W}} + \beta X_{i\mathrm{W}} + \gamma Z_i + \alpha_i + r_{i\mathrm{W}} \quad (4.1)$$

where X is a vector of individual husband (subscript H) or wife (subscript W) characteristics that are presumed to differ across spouses within a couple (e.g., age, education, race-ethnicity), Z is a vector of observed characteristics common to both spouses in a couple (e.g., wife's number of biological children, cohabitation status, duration of relationship, and hours spent together during the week), and α_i represents all unobserved factors that are common to both spouses in a couple. Subtracting Equation 4.1 from Equation 4.0 yields:

$$BMI_{i\mathrm{H}} - BMI_{i\mathrm{W}} = (\mu_{\mathrm{H}} - \mu_{\mathrm{W}}) + \beta(X_{i\mathrm{H}} - \beta X_{i\mathrm{W}}) + (r_{i\mathrm{H}} - r_{i\mathrm{W}}) \quad (4.2)$$

Both γZ_i and α_i have been "differenced out" of the equation and the threat of endogeneity due to unobserved heterogeneity is greatly reduced.

While a fixed effects strategy is an improvement over previous strategies designed to purge dyadic models of social homogamy and convergence, fixed effects

[30] This requires the data be organized in wide format where husband and wife values for each characteristic are recorded on the same line per couple.

models are limited in that they cannot address endogeneity due to unobserved factors that are different between spouses in a couple. This is important since Grilo and Pogue-Geile (1991) find only environmental experiences that are *not* shared among family members appear to contribute to differences in weight and obesity. Also, cultural norms permit some form of heterogeneity among couples that may affect spouses' BMI similarity. Additionally, fixed effects models cannot control for convergence that occurred early in the relationship. Ideally, one would need longitudinal data that was first collected prior to cohabitation (and even prior to shared dating activities).

Results

Descriptive Statistics

Sample Characteristics

Table 2.2 reports the descriptive statistics for the analytic sample. Mean BMI values for both husbands (29.05) and wives (29.79) fell into the overweight range (borderline obese range) and were not significantly different. Overall, nearly 70% of the sample of couples was either overweight or obese. This is slightly greater than population estimates of the percent of overweight adults (Ogden, Carroll, Curtin, McDowell, Tabak, & Flegal, 2006),[31] likely because the study sample is comprised of low-income couples. Significantly more wives were obese than were husbands (43% compared to 35%) and significantly more husbands were overweight than were wives (37% compared to 23%). The percent of husbands and wives who were healthy weight or underweight was not significantly different. Overall age for the sample was 36.5. Husbands were significantly older than wives by about 3 years. Most spouses reported having some college experience but with no college degree (a score of 3 on

[31] Ogden et al., (2006) report 66.2% of the U.S. adult noninstitutionalized population was overweight or obese in 2004.

the education variable). Differences in education attainment between husbands and wives were not significant. Most spouses self-identified as non-Hispanic white (87% of wives and 85% of husbands, n.s.) and 88% of couples were race-ethnically homogamous. Average number of biological children reported by couples was 2.39 with no significant differences in the number of biological children reported by husbands or wives. Average length of cohabitation for couples was 140 months (roughly 12 years) and a majority of couples (57%) reported cohabiting before marriage. On average, couples reported spending approximately 17 hours together per week.

Table 2.2. Descriptive Characteristics of Husbands and Wives (N = 371 Married Couples).

	All		Wives		Husbands		Sig
Variable	Mean	*SD*	Mean	*SD*	Mean	*SD*	Dif.
Body mass index	29.42	7.40	29.79	8.21	29.05	6.47	
Obese	0.39		0.43		0.35		*
Overweight	0.30		0.23		0.37		***
Healthy weight	0.29		0.31		0.27		
Underweight	0.02		0.02		0.01		
Age	36.52	6.79	35.04	5.99	37.99	7.23	***
Education[a]	3.00	1.42	3.07	1.41	3.00	1.42	
Less than high school	0.09		0.08		0.09		
High school	0.33		0.33		0.34		
Some college	0.38		0.38		0.38		
College graduate	0.20		0.20		0.19		
Non-Hispanic white	0.86		0.87		0.85		
Non-Hispanic black	0.03		0.03		0.04		
Non-Hispanic other	0.02		0.02		0.03		
Hispanic	0.06		0.06		0.06		
2-plus races, non-Hispanic	0.02		0.02		0.02		
Race-ethnically homogamous	0.88		0.88		0.88		
Number of biological children	2.39	1.35	2.41	1.28	2.36	1.41	
Cohabited before marriage	0.57		0.55		0.56		
Length of marital relationship	139.96	68.06	139.18	67.81	139.90	69.31	
Hours per week spent with spouse	17.33	7.48	17.07	8.18	17.58	8.36	

Note: BMI values are corrected for reporting error. Excludes couples with pregnant wives. Asterisks indicate the degree to which husbands and wives are different on the characteristic.
[a]A value of 3 = some college, no degree.
*p < .05; **p < .01; ***p < .001.

Size Composition of Married Couples

Correlation analyses. The first research question asked whether spouses' BMI scores were associated. Table 2.3 shows the results of correlation analyses before and after statistically removing the effects of social homogamy and convergence on spousal BMI association. The zero-order BMI correlation for this sample was .304 ($p < .0001$) indicating a high degree of similarity in spousal BMI. Model A shows the interspousal BMI correlation after adjusting for individual spouses' age, education level, and race-ethnicity. The correlation in Model A is 15 percent lower ($r = .288$; $p < .0001$) than the unadjusted correlation indicating that spouses' individual characteristics are associated with BMI. Model B reports the interspousal correlation after controlling for both individual-level characteristics and couple-level social homogamy variables.[32] Removing the effects of social homogamy reduced the spousal BMI correlation by only 2 percent ($r = .283$; $p < .0001$), relative to Model A, indicating that spouse similarity in age, education, and race-ethnicity seems to be a relatively unimportant factor in explaining spousal resemblance in BMI. Model C reports the interspousal correlation after controlling for both individual characteristics and couple-level convergence variables. Controlling for convergence reduced the interspousal BMI correlation by 6 percent ($r = .272$; $p < .0001$), relative to Model A, indicating that convergence may have a greater effect on spouse similarity than does social homogamy. Finally, Model D in Table 2.3 reports the interspousal BMI correlation after adjusting for both social homogamy and convergence (and individual spouse characteristics). The fully adjusted correlation ($r = .267$; $p < .0001$) is 7 percent lower than the correlation adjusting only for individual characteristics (Model A). Consistent with Hypothesis 1, results of the correlation analyses indicate that

[32] Social homogamy in the correlation analyses was measured using the product of spouses' age, the product of spouses' education, and a dummy variable that equaled 1 if both spouses reported the same race-ethnicity, else 0.

social homogamy and convergence have a small effect on spousal BMI similarity; similarity in spousal BMI is largely due to an active assortment affect.

Table 2.3. Interspousal BMI Correlations among Low-Income Married Couples.

	BMI
Unadjusted	.304***
A. Adjusted for age, education, non-Hispanic white race-ethnicity	.288***
B. Adjusted for social homogamy (A + homogeneous race-ethnicity, product of spouses' age, product of spouses' education)	.283***
C. Adjusted for convergence (A + relationship duration, weekly hours together, cohabitation status, number of children)	.272***
D. Adjusted for social homogamy and convergence (B + C)	.267***

Note: BMI values are corrected for reporting error for some race-ethnicities. Pearson correlation coefficients are reported. N = 371 married couples.
***p < .0001.

Additional analyses (not shown) found no association between spouses' heights (r = .06; p = .22).

Difference scores. Spousal BMI difference scores were computed in order to examine the weight composition of the married sample. Spousal difference scores were computed by subtracting the wife's BMI from the husband's BMI. Average spousal BMI difference was -0.74, indicating a high degree of BMI similarity within couples. Consistent with Hypothesis 2, the negative sign on the spousal difference score indicates husbands, on average, were leaner than wives in the overall sample; therefore, among these low-income couples, the female-thinner norm was not observed.

Spousal height difference scores were also computed by subtracting wife height from husband height (not shown). Average spousal height difference was 5.06 inches, a difference in spouse height that was significant (t = 26.60; p < .0001) and consistent with the male-taller norm (Gillis & Avis, 1980).

Relative size. Despite the moderate interspousal BMI correlation and a non-significant difference score, considerable heterogeneity in BMI exists within couples. Figure 2.1 demonstrates this heterogeneity by plotting husbands' BMI scores against wives' BMI scores. Several patterns are worth noting. First, the diagonal line shown in the figure represents perfect spousal matching for BMI. The farther a couple is from the diagonal line, the greater the couple's discrepancy in BMI. No couple was exactly matched based on integer-rounded BMI (e.g., falls exactly along the diagonal). However, approximately one-third (33%) of couples are matched within 3 BMI units (results not shown). This means that 66% of couples remain "unmatched" within 3 BMI units. Additional analyses indicate that of these unmatched couples, 34% are characterized as heavier-husband couples (i.e., couples above the diagonal in Figure 2.1) and 34% of the unmatched couples are characterized as heavier-wife couples (i.e., couples below the diagonal line). The even-thirds split in terms of couple weight composition is not consistent with Hypothesis 2 which proposed that more couples would fall below the diagonal (indicating wives are heavier than husbands) than above. A second pattern worth noting is that as average couple BMI increases, absolute differences in spouses' BMI also increase (also consistent with Hypothesis 2). This may be indicative of a "norms effect" wherein larger differences in spousal BMI are less evident as couple BMI increases and so couples (particularly women) may feel less constrained to maintain a weight similar to their spouse. Alternatively, it may reflect a preference for heavier women among fatter husbands. Third, as average BMI increases, more couples seem to fall below the diagonal line indicating that as couple BMI increases, wives tend to increasingly outweigh their husbands. This study is the first to report these patterns.

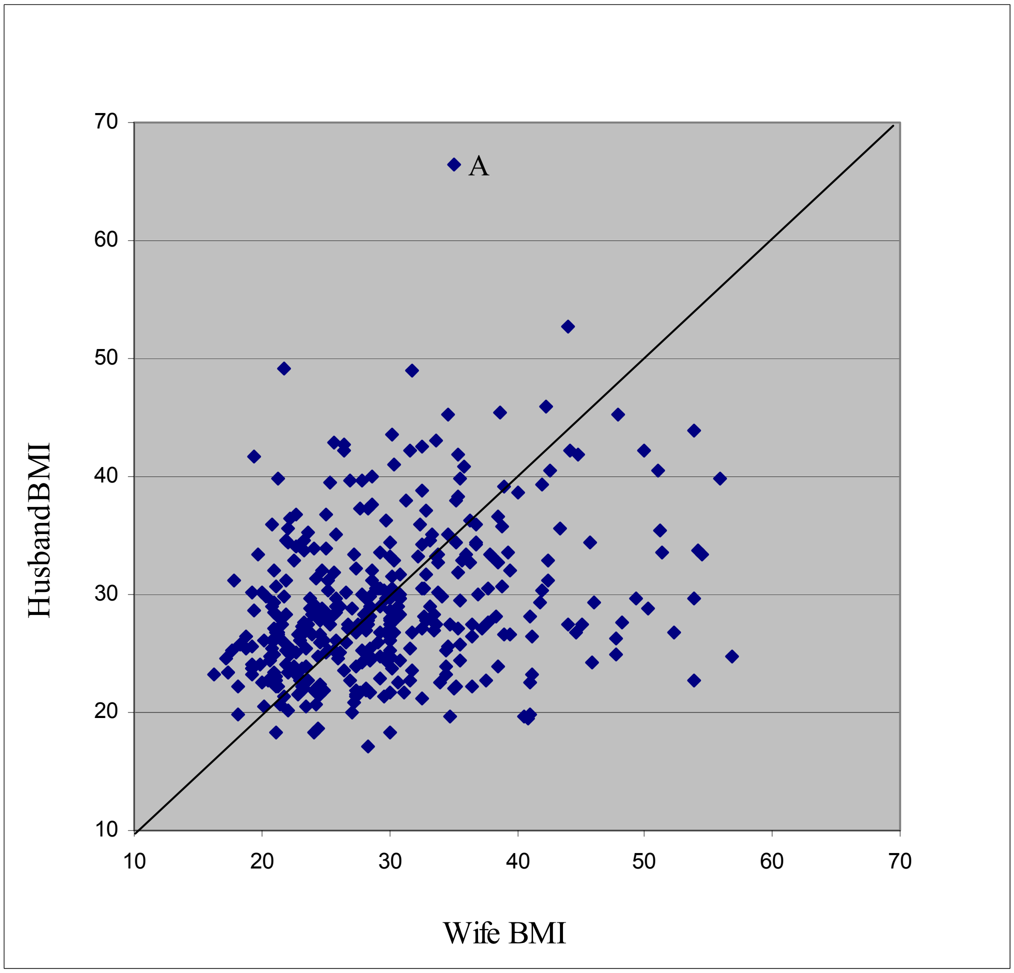

Figure 2.1. Plot of Husband and Wife BMI Values ($r = .304$; $p < .0001$).

Note: BMI values are corrected for reporting error for some race-ethnicities. The couple in Figure 2.1 indicated by the letter A appears to be an outlier. Indeed, the Studentized residual for couple A is 4.76 which exceeds the upper bound critical value delineated by Lund (1975). The couple was not removed from the sample because (a) it exists in the sample and (b) it does not affect the interspousal BMI correlation (e.g. the correlation does not change when the outlier is removed). The multivariate results will be examined to see if they are robust to specifications when the outlier is removed.

In contrast, results for relative height (not shown) find 23% of couples are matched for height within 3 inches (husband is 0 to 3 inches taller), 71% of couples are characterized as male-taller (husband is greater than 3 inches taller), and only 6% of couples are characterized as female-taller. It seems the "cardinal principal of dating" (Bersheid & Walster, 1974) occurred in this sample of married couples.

Size Composition by Weight Status

Because variance in BMI is heterogeneous across the distribution of BMI, interspousal BMI correlations and difference scores were estimated separately by weight status. Figure 2.2 shows the results of conditional interspousal BMI correlations (e.g., controlling for individual characteristics, social homogamy, and convergence as described in Table 2.3, Model D) by husband and wife weight status (e.g., healthy weight, overweight, or obese).[33] This figure shows that only for husbands' are their spouses' BMI scores significantly and positively correlated. In other words, wives' BMI is positively associated with their husbands' BMI but not vice versa. Consistent with previous studies (Averett & Korenman, 1999; Mukhopadhyay, 2008) this finding suggests women's weight matters more to men than does men's weight to women during the mate selection process.

Figure 2.3 graphs the differences in spouse BMI (husband BMI minus wife BMI), by husband, wife, and couple weight status. Partially supporting the female-thinner norm (Hypothesis 2), healthy weight wives are outweighed by their husbands by nearly 5 BMI units. Healthy weight husbands, on the other hand, tend to be outweighed by their wives by nearly 5 BMI units. Overweight couples have the most similar BMI. Obese wives have the most dissimilar BMI to their husbands with wives outweighing husbands by about 7 BMI units. This study is the first to report spousal difference scores by weight status.

---

[33] There were not enough underweight spouses to compute interspousal BMI correlations for underweight husbands or wives.

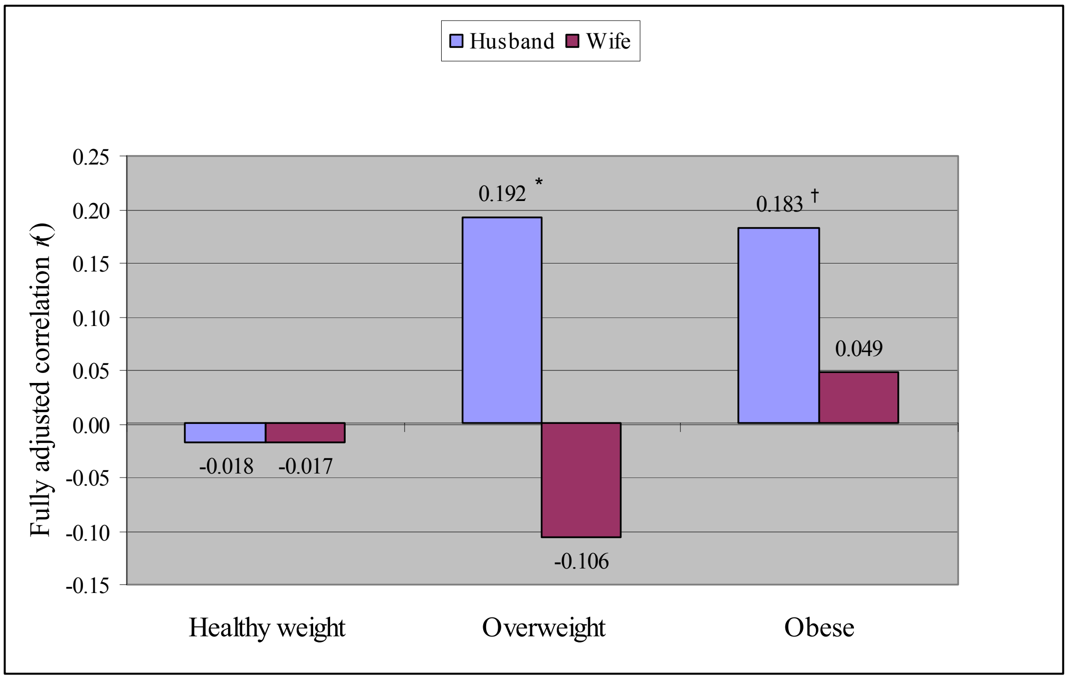

Figure 2.2. Interspousal BMI Correlations by Husband and Wife BMI Status.

Note: BMI values corrected for reporting error for some race-ethnicities.
†p < .10; *p < .05.

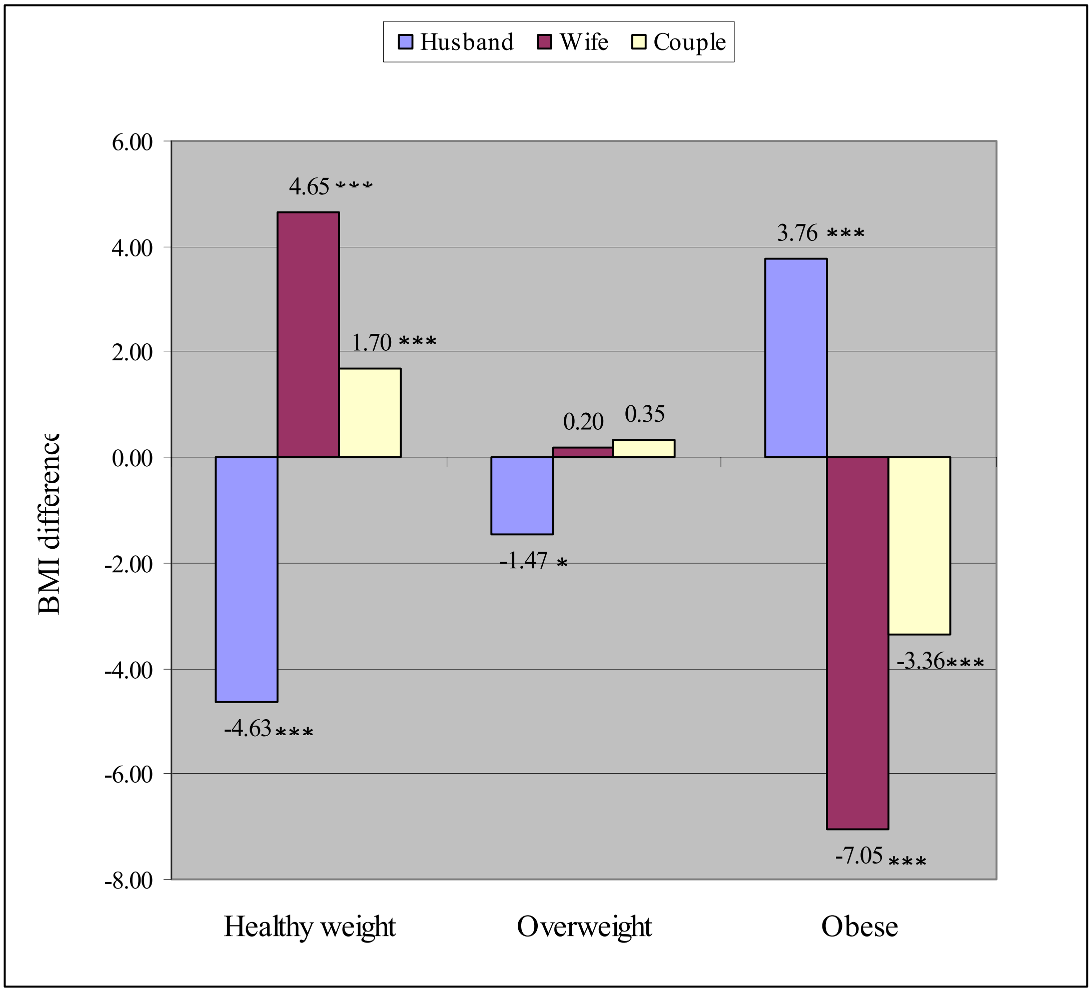

Figure 2.3. Difference in Spouse BMI (Husband BMI Minus Wife BMI) by BMI Status of Husbands, Wives, and Couples.

Note: BMI values corrected for reporting error for some race-ethnicities.
$*p < .05$; $**p < .01$; $***p < .001$.

Figure 2.4 further explores differences in BMI by graphing the absolute difference in spousal BMI by husband, wife, and couple weight status. The U-shaped differences in spouse BMI suggest that differences in spousal BMI are greatest at the extremes of the BMI distribution, particularly at the high end (consistent with Hypothesis 2). In other words, the heaviest couples are the most heterogeneous in terms of BMI, a finding that has not been previously reported.

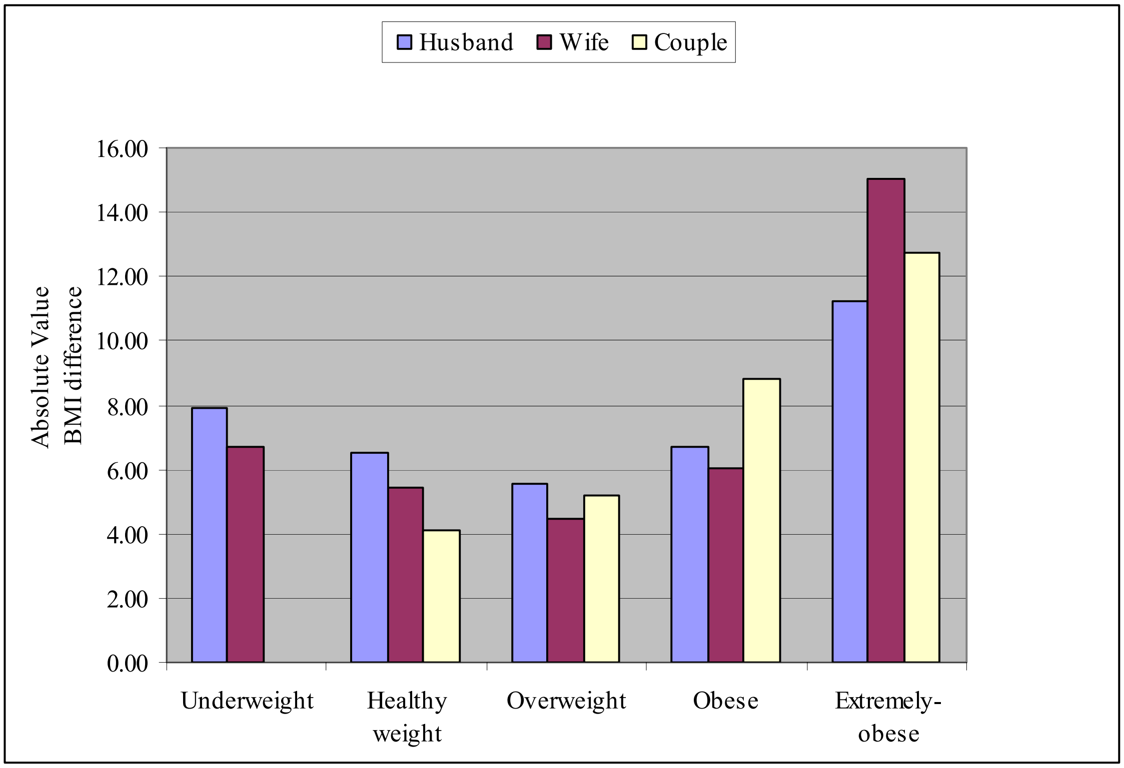

Figure 2.4. Absolute Difference in Spouse BMI by BMI Status of Husbands, Wives, and Couples.

Note: BMI values corrected for reporting error for some race-ethnicities.

Size Composition by Education Status

To examine whether spousal BMI similarity varied with education, difference scores (husband BMI minus wife BMI) were calculated separately by education level. Figure 2.5 graphs differences in spouse BMI by the education status of husbands, wives, and couples (1=high school diploma or less; 2=some college, no bachelor's degree; 3=bachelor's degree or higher). Consistent with Hypothesis 2, spouses with higher education show BMI differences consistent with the female-thinner norm though differences in spouse BMI are not significant (the BMI difference of 4.01 is not significant because it is based on a subsample of n = 7 and should therefore be ignored). When husbands, wives, or couples have a high school diploma or less, wives significantly outweigh husbands.

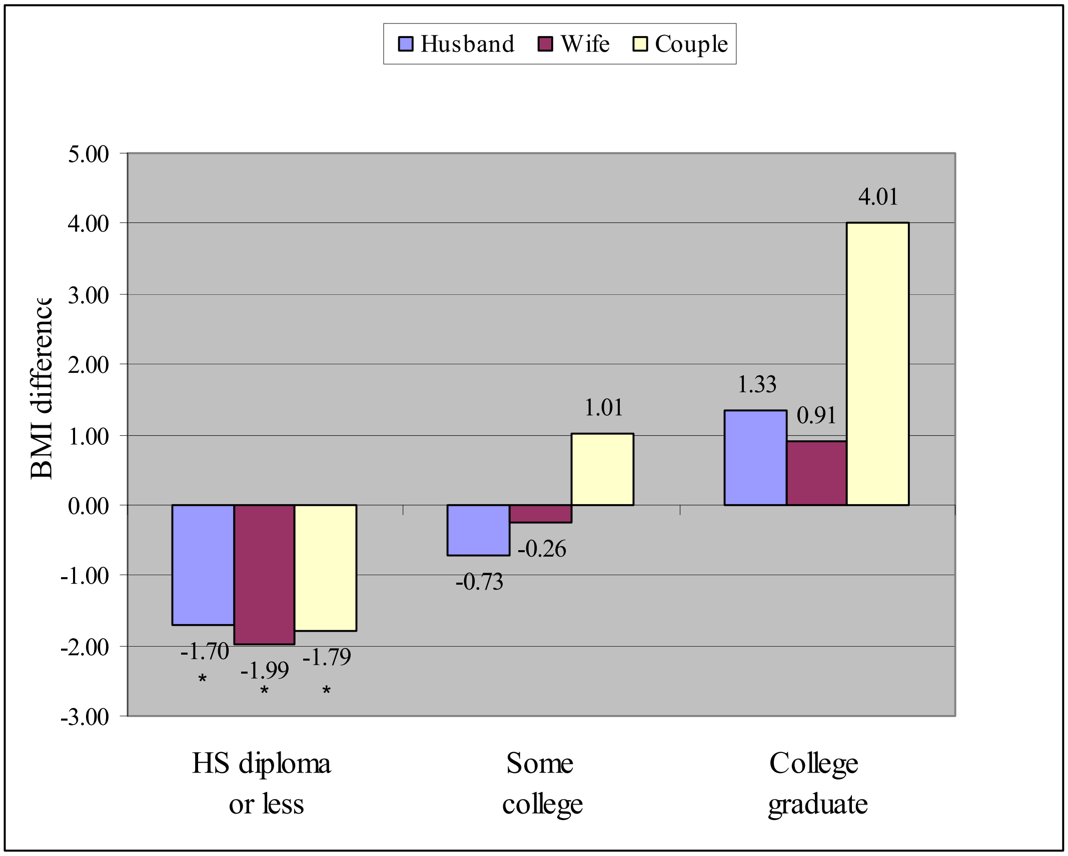

Figure 2.5. Difference in Spouse BMI (Husband BMI minus Wife BMI) by Education Level of Husbands, Wives, and Couples.

Note: BMI values corrected for reporting error for some race-ethnicities. Only 7 couples have, on average, a college degree or greater. Thus, the BMI difference of 4.01 for college graduates should be ignored.
*$p < .05$.

Is There Evidence of Social Homogamy?

Simple spousal correlations for sociodemographic characteristics were calculated (not shown). The correlation estimates show strong positive assortative mating for age (Pearson $r = .79$; $p < .0001$), education (Spearman rho = .49; $p < .0001$), and race-ethnicity (non-Hispanic white = 1 versus all other race-ethnicities =0; Spearman rho = .54; $p < .0001$). Because each of these factors is known to be associated with weight, these findings justify the need to take into account social homogamy when estimating spousal similarity in BMI.

Is there Evidence of Convergence?

To examine the possibility of spousal convergence in weight over time, BMI discrepancy scores (absolute value of husband weight minus wife weight) were plotted against the duration the couple had been living together (Figure 2.6). If convergence occurred, then BMI discrepancy should decrease with length of cohabitation. Figure 2.6 shows no evidence of convergence in BMI over time. Similarly, Figure 2.7 shows no evidence of a convergence effect based on the number of hours spouses spend together each week.

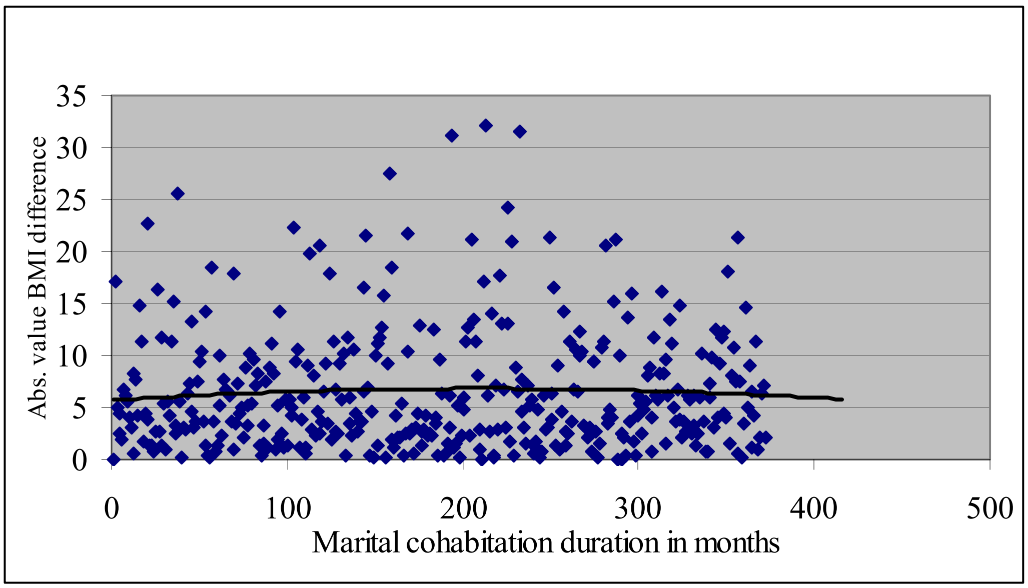

Figure 2.6. Effect of Duration of Marital Cohabitation on Absolute Value of Spouse BMI Difference.

Note: Fitted polynomial trend line allowing for curvilinear association is shown. Pearson r = .08; p = .13.

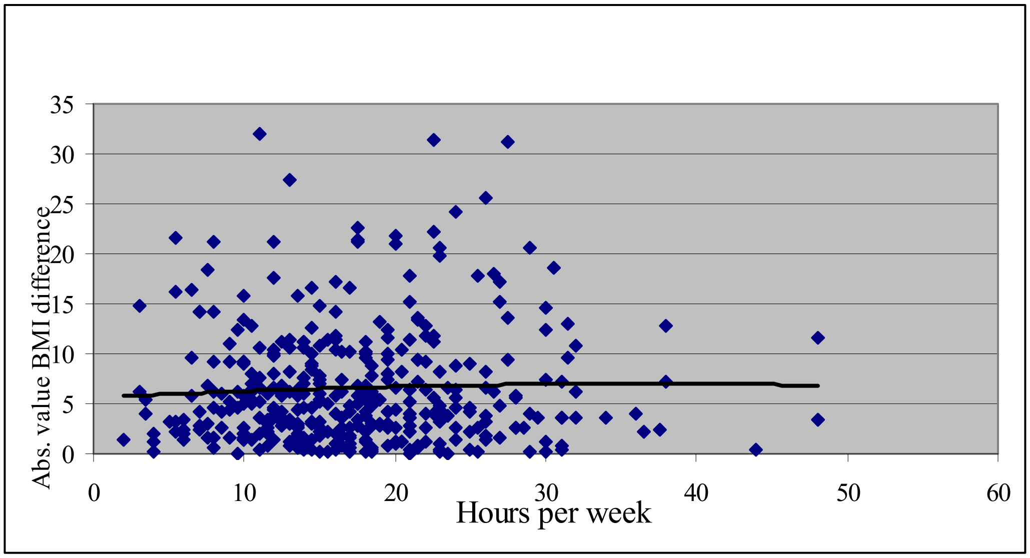

Figure 2.7. Effect of Weekly Hours Spouses Spend Together on Absolute Value of Spouse BMI Difference.

Note: Fitted polynomial trend line allowing for curvilinear association is shown. Pearson r = -.05; p = .05.

In additional analyses (not shown), cohabitation status (i.e., whether the couple cohabited before marriage) was positively associated with significantly greater weight discrepancy of 1.74 BMI units (t = 2.69; p < .01). Also, the number of biological children (born either to the wife or husband) was not associated with differences in spousal BMI.

Results from Multilevel Analyses

Unconditional Means Model

Table 2.4 (Model 2) reports the maximum likelihood estimates of the fixed and random effects of the unconditional random intercepts model allowing for heterogeneity of variance in BMI across gender. Couple mean BMI was 29.42 and average BMI discrepancy was -.74 and not significant. The negative coefficient for gender indicates that, on average, wives are heavier than their husbands (though the difference is not significant). These results are substantively identical to those reported in the descriptive section above.

Variances of the random effects for the null model are also reported. Both the couple-level variance (16.13) and the individual-level variance (38.37) are significantly different from zero. This means that significant variance exists in average couple BMI and nearly twice as much variance in BMI occurs within couples! The proportion of variance occurring between couples is given by the intraclass correlation (.30). Thus, 70% of the variance in BMI occurs within couples (1 - .30). This analysis identifies substantial variation in BMI between married spouses that conventional correlation analyses do not detect. The moderate intraclass correlation (ICC) serves a diagnostic to indicate spouses' BMI scores are dependent and an OLS analysis may yield misleading results. Model 1 in Table 2.4 reports the OLS results for the null model. OLS estimates are identical to the HLM estimates however, the HLM results are more efficient since they produce correct standard errors.

Conditional Hierarchical Models

Three conditional models were fit to explain the variance in BMI and to estimate conditional differences in spousal BMI. One adjusts for social homogamy (Model 3), the second adjusts for convergence (Model 4), and the third adjusts for both (Model 5). Model 3 in Table 2.4 shows the average difference in spouse BMI after controlling for social homogamy. Conditioning on couples' age and education and taking into account spouses' differences in age, education, and race-ethnicity increases the spousal BMI difference to -4.74, a difference that is significant (p = .008). On average, wives are nearly 5 BMI units heavier than their husbands. The increase in BMI difference indicates that social homogamy may explain some of similarity in spouses' BMI reported in previous studies. Variances of the random effects remain highly significant; controlling for social homogamy accounted for 7% of the between-couple and 2% of the within-couple variance in BMI. Additional results show couples with higher education have significantly lower mean BMI and the association between education and BMI varies for husbands and wives. Fit statistics show Model 3 fits the data significantly better than Model 2 ($\chi^2 = 26.7$; $p <$ 001).

Model 4 in Table 2.4 reports the average difference in spouse BMI after controlling for convergence. Conditioning on the number of wife's biological children, duration of cohabiting relationship, weekly time spent together, and cohabitation status, reduces the spouse difference score to -.209, a difference that is not significant ($p = .878$). The reduction in spousal differences suggests that shared living environment may have a small diverging effect on spouses BMI (or no influence much at all). Analysis of the model's variance components show that convergence explained 10% of the between-couple variance in BMI whereas it explained only 2% of the within-couple variance in BMI. Variances of the random effects remain highly significant. Other results show greater number of biological children reported by wives was associated with lower couple BMI. The effect of children on BMI was not significantly different for husbands or wives. Couples who cohabited prior to marriage were, on average, nearly 3 BMI units heavier than couples who did not cohabit before marriage. The effect of cohabitation on couple BMI was marginally different for wives and husbands. This model fits the data significantly better than the null model ($\chi^2 = 28.5$; $p <$ 001).

Table 2.4. Results from Hierarchical Linear Models of Spouse BMI Similarity.

	OLS Null Model	Heirarchical Models: Null Model	Control for SH	Control for CONV	Control for SH & CONV
	1	2	3	4	5
Fixed effects					
Intercept (couple mean BMI), γ_{00}	29.417***	29.417***	32.528***	27.601***	30.675***
	(.271)	(.309)	(.802)	(.969)	(1.494)
Gender (couple difference in BMI), γ_{10}	-.742	-0.742	-4.736**	-.210	-4.840†
	(.543)	(.455)	(1.772)	(1.370)	(2.580)
Couple mean age			-.002		-.020
			(.048)		(.061)
Gender x couple mean age			.053		-.024
			(.076)		(.096)
Gender x difference in age			.069		.129
			(.107)		(.114)
Couple mean education			-1.026**		-.815***
			(.245)		(.238)
Gender x couple mean education			.968**		.929*
			(.366)		(.359)
Gender x difference in education			.248		.291
			(.327)		(.342)
Gender x same race-ethnicity			.999		.755
			(1.368)		(1.208)
Number of biological children				-.477*	-.505*
				(.227)	(.221)
Gender x number of biological children				.359	.432
				(.353)	(.358)
Duration of marital relationship				.005	.005
				(.004)	(.005)
Gender x duration of marital relationship				.008	.010
				(.007)	(.008)
Hours spent together during week				-.023	-.036
				(.042)	(.042)
Gender x hours spent together during week				-.042	-.036
				(.061)	(.060)
Cohabited before marrying				2.617***	2.065**
				(.608)	(.626)
Gender x cohabited before marrying				-1.502†	-.969
				(.885)	(.903)

Table 2.4 (Continued)

Random effects					
Between-couple variance in BMI, τ_{00}		16.130***	15.000***	14.470***	13.929***
Within-couple variance in BMI, σ^2		38.373***	37.417***	37.674**	36.843***
Intraclass correlation (ICC)		.296	.286	.278	.274
% between-couple variance explained[a]			.07	.10	.14
% within-couple variance explained[a]			.02	.02	.04
Deviance		5038.4	5011.8[b]	5009.9[b]	4990.8[cd]
R -square	.003				

Note: *N* = 371 married couples. SH = social homogamy. CONV = convergence. BMI values are corrected for reporting error for some race-ethnicities. Robust standard errors in parentheses.
[a]Relative to Model 2. [b]Significant improvement in fit compared to Model 2. [c]Significant improvement in fit compared to Model 3. [d]Significant improvement in fit compared to Model 4.
[†]$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$.

Model 5 reports the average difference in spouse BMI after controlling for both social homogamy and convergence. Average spousal BMI difference was -4.80 and significant at the 10% level. This difference is presumed to represent the active assortment effect on spouse BMI and is consistent with Hypothesis 2. Also consistent with Hypothesis 2, wives tend to outweigh their husbands. Results also show greater couple education and greater number of biological children born to wives are associated with lower couple BMI. Relative to couples who did not cohabit before marriage, couples who cohabited before marriage are significantly heavier. Overall, Model 5 explains 14% of the between-couple variance in BMI and 4% of the within-couple variance in BM, relative to the null model. Variances of the random effects remain highly significant indicating considerable variance in BMI remains to be explained both within and between couples. Model 5 fits the data significantly better than Models 2, 3, and 4.

Results from Fixed Effects Analyses

If the models above suffer from endogeneity due to omitted variable bias, then the estimates of spousal BMI discrepancy may be biased. To control for unobserved factors that are common to each spouse in a couple, fixed effects regression was employed. In this model difference in spousal BMI was regressed on spousal age difference, race-ethnicity difference, and difference in the number of biological children born to the husband and wife. Duration of cohabiting relationship, hours spent together each week, and cohabitation status were excluded from the models since these variables do not vary within couple and are differenced out of the fixed effects equation. The results of the fixed effects analyses are reported in Table 2.5. After controlling for stable unobserved heterogeneity as well as differences in spousal age, education, race-ethnicity, number of biological children, the average difference in spousal BMI is -1.22 ($p < .05$). Wives are, significantly, albeit not substantially, heavier than their husbands. This finding is in contrast with Hypotheses 3 that predicted a large difference score, ceteris paribus. The fixed effects estimate of -1.22 is considerably smaller than the estimate produced in the multilevel analysis (-4.84). This suggests that unobserved factors that are common to both spouses (i.e., shared meals, shared resources, similar background experiences) may have a diverging effect on spouse BMI. Previous reports of active assortative mating for BMI may be underestimated.

Table 2.5. Results from Couple Fixed Effects Models of Spouse BMI.

	1	2
Intercept (BMI difference)	-.742	-1.217*
	(.455)	(.554)
Age difference		.149
		(.106)
Education difference		.203
		(.325)
Race-ethnic difference		.330
		(.475)
Biological children difference		-1.035*
		(.473)
R -square	.000	.019

Note: *N* = 371 married couples. BMI values are corrected for reporting error for some race-ethnicities. Robust standard errors in parentheses.
†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$.

BMI Differences by Weight Status

Figure 2.8 reports the results of fixed effects analyses run separately by husband and wife weight status (e.g., healthy weight, overweight, or obese).[34] Results of these models are only partially consistent with the hypothesis of the female-thinner norm (Hypotheses 2 and 3). In couples where the husband falls within the recommended healthy weight range, wives tend to outweigh husbands by nearly 3 BMI units, whereas in couples where the wife falls within the recommended range, wives tend to be about 4 BMI units leaner than their husbands. Wives outweigh husbands by about 2 BMI units in couples where husbands are overweight. In couples where husbands are obese, husbands tend to outweigh their wives by about 3 BMI units, whereas in couples where wives are obese, wives tend to outweigh their husbands by 8 BMI units. These results are somewhat consistent with the hypothesis that spouse BMI will be more dissimilar at higher levels of BMI (Hypothesis 2).

[34] There were insufficient numbers of underweight wives or husbands to produce results for underweight spouses.

BMI Differences by Education Status

Figure 2.9 reports the results of fixed effects analyses run separately by husband and wife education (e.g., high school education or less, some college but no bachelor's degree, bachelor's degree or higher). Overall, the results are consistent with Hypotheses 2 and 3: at lower levels of education, wives tend to out weigh husbands, whereas at higher levels of education, husbands tend to outweigh wives (though the result for wives with a bachelor's degree or greater is not significant). The hypothesis that differences in spouse BMI will decline with increasing education is only somewhat supported.

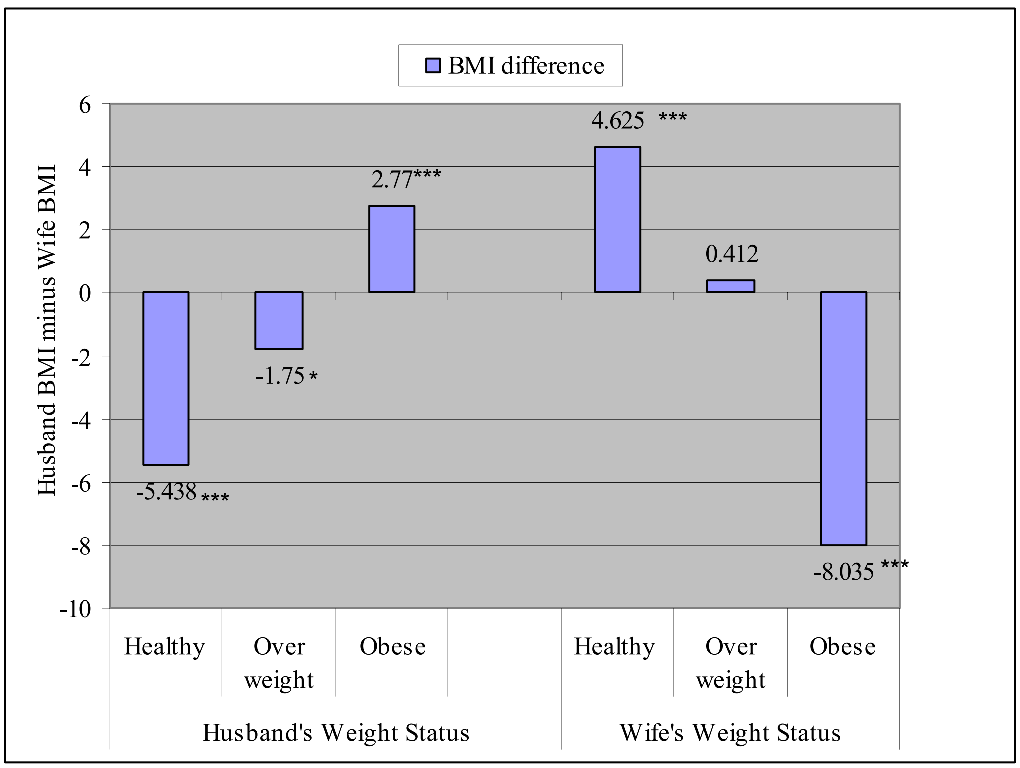

Figure 2.8. Fixed Effects Results of Spouse BMI Difference by Husband and Wife Weight Status.

Note: N = 371 married couples. Healthy weight is $18.5 \leq BMI < 25$. Overweight is $25 \leq BMI < 30$. Obese is $BMI \geq 30$. BMI values are corrected for reporting error for some race-ethnicities. Robust standard errors in parentheses. $^{\dagger}p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

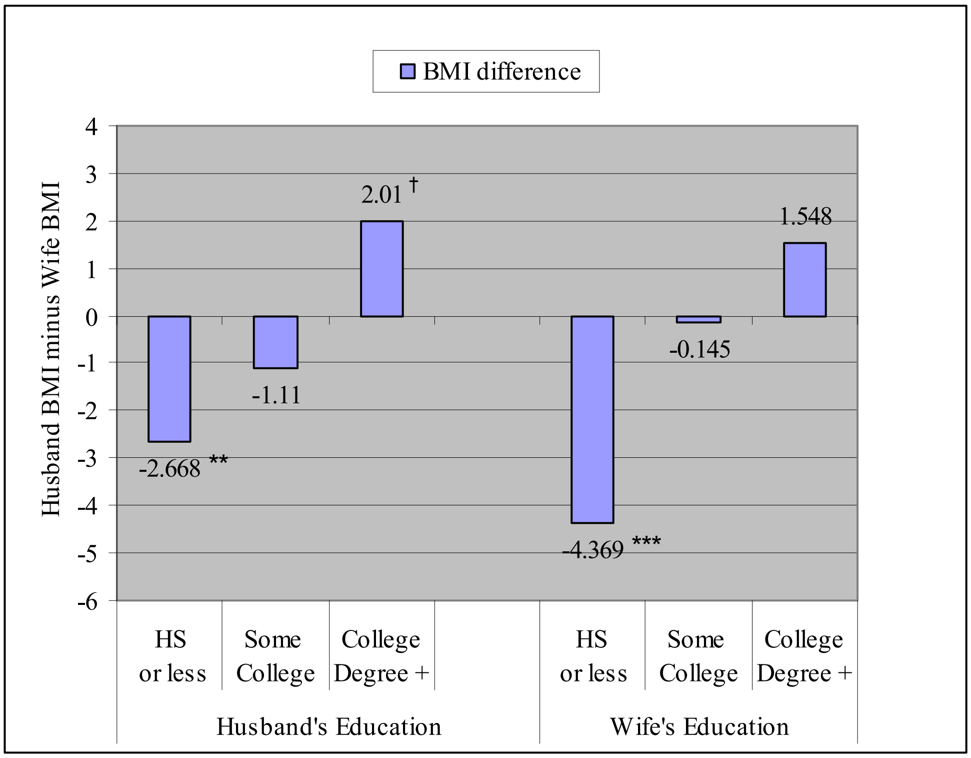

Figure 2.9. Fixed Effects Results of Spouse BMI Difference by Husband and Wife Education Level.

Note: N = 371 married couples. Healthy weight is $18.5 \leq$ BMI < 25. Overweight is $25 \leq$ BMI <30. Obese is BMI ≥ 30. BMI values are corrected for reporting error for some race-ethnicities. Robust standard errors in parentheses.
†p < .10; *p < .05; **p < .01; ***p < .001.

Robustness Analyses

Additional analyses were conducted in order to examine whether the reported results are robust to different specifications of the multilevel and fixed effects models.

Health Concordance

I first examined whether the inclusion of measures of spouse health affected the above results.[35] Absent from previous studies of assortative mating for weight is the inclusion of health measures. Health concordance among spouses is well-documented (Meyler, et al., 2007) and Monden (2007) shows that similarity in partners' health is likely due to active assortment rather than to intermate influence, shared environment, or shared risk behavior. Because health is associated with BMI, failing to control for health similarity may upwardly bias assessments of assortative mating for BMI.

Health is measured using the question: "In general, how would you rate your health?" Respondents selected from the following options: *Excellent* (1), *very good* (2), *good* (3), *fair* (4), and *poor* (5). Responses were reverse coded so that higher scores reflect better health. Mean health was 3.53 (*SD*: 0.96) for husbands and 3.44 (*SD*: 0.98) for wives, indicating most spouses reported good health. Average difference in spousal health was 0.086 and was not significant indicating a high degree of health concordance between spouses. Partial spousal health correlations that controlled for individual characteristics, social homogamy, and convergence, were positive and highly significant (Spearman $r = .291$; $p < .0001$) indicating spouses' health scores are associated. Health was negatively associated with BMI for both husbands ($r = -.333$; $p < .0001$) and wives ($r = -.237$; $p < .0001$). Health difference was not associated with duration of cohabitation or weekly hours spouses spend together suggesting a lack of spousal convergence in health status.

[35] Health was excluded from the previous analyses because health is endogenous with education.

A fully conditional interspousal BMI correlation was computed that controlled for individual spouse health and a couple-level measures of health concordance (the product of husband and wife health), in addition to individual characteristics, social homogamy, and convergence. In other words, the health measures were added to Model D in Table 2.3. Controlling for health reduced the BMI correlation from .267 to .243 ($p < .0001$) indicating that health and health concordance accounts for some of the similarity in spousal BMI.

Next, mean couple health, centered at the grand mean (COUPHLTHc), its interaction with gender (COUPHLTHc x GENDER) and couple health difference (husband health minus wife health) interacted with gender (HLTHDIF x GENDER), were added to multilevel Model 5 reported in Table 2.4. Adding the health measures significantly improved the fit of the model relative to Model 5 ($\chi^2(3) = 69.1$; $p < .001$). Including the health measures did not substantially alter the findings reported for Model 5 above. Mean difference in spouse BMI was slightly smaller ($\beta = -4.471$ compared to $\beta = -4.840$) and was significant at the 10% level. This reduction suggests that couples' relative health may have a small diverging effect on spouse BMI. The coefficient on couple mean health was negatively associated with BMI ($\beta = -2.456$; $p < .0001$) indicating that greater couple health is associated with lower BMI. The effect of health on BMI varied for husbands and wives ($\beta = -1.614$; $p < .0001$). Relative to Model 5, including the health measures further explained 17% of the between-couple variance in BMI and 5% of the within-couple variance in BMI (e.g., relative to Model 5, Table 2.4). Results of the multilevel models suggest couples tend to sort on health and failing to control for couples' health status may downwardly bias estimates of assortative mating for BMI.

Finally, the spousal health difference score was added to the fixed effects Model 2 reported in Table 2.5. Because the fixed effects models above should address the omission of spousal measures of health if spouses were health concordant, I expected little changes in the fixed effects results after including such measures. Results of the fixed effects analyses are largely consistent with those reported for the multilevel analyses; controlling for health slightly reduced the BMI difference score (β = -1.037 compared to β = -1.217) which was significant at the 10% level. Again, this suggests health may have a small diverging effect on spouse BMI. The coefficient on the health difference was highly significant (β = -1.684; p < .0001).

Weight Change and Divorce

Body weight is associated with marital status and relationship transition (Averett, Sikora, & Argys, 2008; Sobal, Rauschenbach, & Frongillo, 2003). Consequently, estimates of assortative mating for BMI may be biased by selective attrition due to divorce. To examine this possibility, I tested whether the results were robust to models run on a sub-sample of the data restricted to couples in which both spouses are in first marriages and both are age 18-34 (N = 106). The fully conditional interspousal BMI correlation run on this sub-sample (r = .516; p < .0001) was significantly larger than the fully conditional correlation reported in Table 2.3, Model D (χ^2 = 7.11; p = .008). Results from multilevel analyses show these couples have lower mean BMI (intercept, β = 27.30, p < .0001), and BMI differences that are positive and not significant (β = 3.53; p = .608), relative to Model 5 reported in Table 2.4. Analyses of the variance components from the multilevel model shows nearly equal variance in BMI occurring between couples and within couples (ICC = .52). In other words, the proportion of variance occurring within couples is considerably lower in this young sub-sample (48% compared to 70%). Results of the fixed effects models indicate young spouses in first marriages are similar in BMI (β = -1.38; p = .134). Though the difference is not significant, the magnitude and direction of the difference is largely similar to that reported in Table 2.5, Model 2. These results suggest that selective attrition through divorce may bias the results of studies that rely solely on interspousal correlations to infer assortative mating. Models that are able to address unobserved heterogeneity may be less biased.

Race-Ethnicity

The MARS data are largely homogeneous in terms of race-ethnicity. Eighty-one percent of couples in the MARS data are non-Hispanic white. It is possible that the inclusion of a small amount of non-White couples could spuriously increase the interspousal BMI correlation (Pennock-Román, 1984). I therefore repeated the correlational, multilevel, and fixed effects analyzed on a sub-sample of the data restricted to non-Hispanic white couples ($N = 299$). The results are consistent with those reported in the tables above for the full sample. The fully conditional interspousal BMI correlation (e.g., Table 2.3, Model D) was somewhat smaller than the correlation reported for the full sample ($r = .226$; $p < .0001$). The BMI difference score reported in the multilevel model is only slightly lower than that reported in Table 2.4 Model 5 ($\beta = -4.566$; $p = .09$). Spousal BMI difference reported in the fixed effects analyses is largely unchanged though it is now significant ($\beta = -1.276$; $p < .05$). The reduction in difference scores suggests that non-Hispanic white couples may be more similar in BMI than are race-ethnically diverse couples.

Uncorrected BMI

The BMI values used in this study were corrected for self-reporting error using the coefficients estimated by Cawley and Burkhauser (2006). Correction coefficients were only applied to the BMI scores for non-Hispanic white, non-Hispanic black, and Hispanic spouses. Thus, about 4% of the sample remained uncorrected. In order to test whether these corrections had a substantial effect on the results, the multilevel and fixed effects analyses were reestimated using the raw BMI scores for all spouses. Corrected BMI values were not significantly different for husbands or wives (corrected BMI values were less than 1 BMI unit higher for both husbands and wives). However, regression results using uncorrected BMI had some important differences. First, in the multilevel models, the fully conditional spousal BMI difference score (e.g., Model 5, Table 2.4) was somewhat reduced and was no longer significant by conventional standards (β = -3.508; p = .116). In the fixed effects analysis (e.g., Model 2, Table 2.5), the intercept was nearly identical to the coefficient produced in the multilevel null model and was not significant (β = -.747; p = .164).

Discussion

The current study examines assortative mating for BMI in a sample of low-income married couples. Prior research on assortative mating for BMI has focused primarily on one question: Do individuals tend to select as their spouses, others with similar BMI to their own? Answering this question not only involves adequately measuring the association between spousal BMI but removing the confounding effects of social homogamy and environmental influence (i.e., convergence) on spousal BMI similarity. The main method for inferring assortative mating for BMI is with the interspousal BMI correlation coefficient (Speakman, 2007). This study replicates and extends previous research on assortative mating for BMI by reporting both interspousal correlation coefficients and spousal BMI difference scores. Furthermore, the study utilizes multilevel analyses and fixed effects regression techniques to not only control for the confounding effects of *both* social homogamy and convergence but also to address the possibility of bias due to unobserved heterogeneity within couples. Despite the limitations inherent in the study sample of low-income married couples, this study provides a comprehensive investigation of assortative mating for BMI. Some of the questions this study asked include: What is the average difference in spouse BMI? Do husbands tend to be heavier than wives, or vice versa? How much variance in BMI occurs within couples? Does social homogamy or convergence explain variance in spouse BMI? How might unobserved heterogeneity within couples bias assessments of spouse BMI associations?

I found significant and positive interspousal BMI correlations that are in accordance with previous findings and indicative of spouse similarity in BMI. However, using spousal difference scores as the measure of assortative mating for BMI, I found evidence of spousal BMI heterogamy. This study showed that among low-income couples wives tended to significantly outweigh their husbands, although the difference in spouse BMI was not large. This finding was expected for the study sample as a whole and is consistent with research documenting gender differences in the association between BMI and socioeconomic status (e.g., Sobal & Stunkard, 1989). Future research that measures BMI differences among couples from younger cohorts or among couples with higher socioeconomic status (couples for whom the female-thinner norm may be especially relevant) may find different results.

A main goal of this study was to propose and test the hypothesis of the female-thinner norm. For the overall sample of married couples, evidence of the female-thinner norm was not substantiated. This is likely due to the unique sample of low-income couples used in the present study. However, evidence of the female-thinner norm was observed when models were estimated by husbands' and wives' education level and BMI status. As predicted, college-educated husbands and wives have spousal BMI differences consistent with the female-thinner norm. This finding corroborates the findings of Garn et al. (1989a) who show higher educated husbands tend to exceed their wives in fatness using skinfold measurements. Also as expected, wives in the recommended (healthy) range of BMI had BMI differences scores consistent with the female-thinner norm. This finding may reflect underlying income or status effects or, alternatively, may suggest that norms of acceptable heterogamy may be more salient to some groups and not others. Further exploration of the association between socioeconomic status, weight status, and spouse relative weight is warranted.

The current study extends and elaborates upon previous studies by controlling for both homogamy and convergence. Small effects of social homogamy and convergence were observed. Controlling for social homogamy and convergence tended to increase the spousal BMI difference score. This suggests that previous studies that failed to control for these confounding process may have reported upwardly biased assortment effects. An additional contribution made by this study was the utilization of couple fixed effects methods. To my knowledge, this study is the first to attempt to use this method to control for all possible factors common between spouses in a couple that could confound estimates of active assortative mating. Results of the fixed effects models relative to the multilevel models suggest that common unobserved factors in couples may actually have a diverging effect on spouse BMI. This finding was not expected. The *a priori* hypothesis predicted removal of unobserved heterogeneity would result in larger differences in spouse BMI. In other words, it was assumed that the removal of the effects of underlying passive processes would reveal larger differences in spouse BMI. This hypothesis needs to be tested using different data.

A new result from the multilevel analyses was that 70% of the variance in BMI occured within-couples in the sample. This indicates that spouses exhibited more variance in BMI than did couples (i.e., there was more variance between spouses within a couple than between couples in the sample). This finding begs further exploration since it identifies important variability in spouse BMI. Controlling for couple-level measures of age, education, race-ethnicity (including differences in those characteristics) and couple-level measures of convergence explained little of the within-couple variation in BMI. Explaining both within- and between-couple variance in BMI is an area future research to should examine.

The current study further added to the literature about assortative mating for weight by identifying several mechanisms believed to produce BMI heterogamy in contemporary U.S. culture. The ubiquitous focus on matching in the current literature coupled with the nearly universal use of interspousal correlations to estimate the association between spouses' BMI has produced a body of research on mate selection and weight that has a fairly narrow scope. The results of this study suggest future researchers should ask questions beyond that of linear association. Future analyses should be comprehensive and include broader hypotheses about spousal BMI association and employ both correlation estimates and difference scores.

When evaluating the results reported in this study, it is important to consider several limitations of this research. First, the data do not represent a random sample of low-income couples with coresident minor children and with wives who are age 15-44 (the selection criteria used to collect the data used in this study). The MARS data are over-representative of non-Hispanic white couples which limits the study's generalizability to other low-income couples and families. The lack of race-ethnic diversity in the sample precluded the examination of potentially important differences in assortative mating for BMI among non-white couples and among interracial/interethnic couples.

Second, the data used in this study provide a cross-sectional snapshot of spouses who have been living together on average for 12 years. Although the study improves upon previous research by controlling for BMI similarity due to social homogamy, convergence, health assortment, and unobserved heterogeneity, one cannot be certain the results of this study are due to active initial assortment effects. Ideally, longitudinal data should be collected at the beginning of courtship and prior to any cohabitation. Following couples prospectively from relationship initiation would allow researchers to ask more informative questions about how spouse BMI covaries over time such as: Do couples converge in weight equally (if at all)? Do initially mismatched couples converge because the relatively leaner spouse becomes heavier or because the relatively heavier spouse becomes leaner? Do couples regress to a mean BMI value?

Third, results in this study were based on self-reported BMI rather than measured BMI. Self-reported height and weight used to calculate BMI are known to be biased in systematic ways (Cawley & Burkhauser, 2006). For example, women tend to understate their weight whereas men tend to overstate height which results in underestimates of BMI. This study improves on previous research by attempting to correct BMI for self-reporting error (2006). Some results of the study, however, were not robust to the different specifications of BMI. This may suggest that the corrections derived from the NHANES III data may not be transportable to the data used in the current study. Furthermore, the limitations of BMI as a measure of adiposity in men and women are well-known (2006). It is possible the results of this study are confounded by measurement issues. Researchers who study this phenomenon in the future would benefit from using measured height and weight to calculate BMI as well as more accurate measures of fatness and adiposity such as skinfold tests and waist circumference.

Finally, that actual differences in spouse BMI were detected in this study suggests that new research needs to ask: What size difference in BMI is an important difference? For example, does a difference threshold exist that has implications for married couples' health or marital quality? Does direction of the difference matter? Answering such questions will greatly contribute to further understanding of this topic.

Despite these limitations, the current study asked new questions about assortative mating for BMI and applied novel statistical techniques to the study of assortative mating. It is hoped that future researchers are challenged to broaden their perspectives when designing new studies, to identify new and important questions about how couples sort on BMI, and to build a more comprehensive picture of the complex associations between body weight, relationship formation, and health. A goal of such future research should be to better understand how to help couples and families manage and improve their health and wellbeing.

REFERENCES

Allison, D. B., Neale, M. C., Kezis, M. I., Alfonso, V. C., Heshka, S. & Heymsfield, S. B. (1996). Assortative mating for relative weight: Genetic implications. *Behavior Genetics, 26*(2), 103-111.

Allison, P. D. (2002). *Missing Data.* Thousand Oaks, CA: Sage Publications, Inc.

Allison, P. D. (2007, October). Missing Data. (Available from Statistical Horizons, 530 New Gulph Road, Haverford , PA 19041).

Allison, P. D. (2008). Longitudinal Data Analysis Using SAS. (Available from Statistical Horizons, 530 New Gulph Road, Haverford , PA 19041).

Averett, S. L., & Korenman, S. (1999). Black-white differences in social and economic consequences of obesity. *International Journal of Obesity, 23*, 166-173.

Averett, S. L., Sikora, A., & Argys, L. M. (2008). For better or worse: Relationship status and body mass index. *Economics and Human Biology, 6*, 330-349.

Bar-Tal, D., & Saxe, L. (1976). Perceptions of similarly and dissimilarly attractive couples and individuals. *Journal of Personality and Social Psychology, 33*, 6, 772-781.

Becker, G. S. (1976). *The Economic Approach to Human Behavior.* Chicago, IL: The University of Chicago Press.

Bersheid, E., & Walster, E. (1974). Physical attractiveness. In L. Berkowitz (Ed.), *Advances in experimental social psychology, vol. 7*. New York: Academic Press.

Bove, C. F., Sobal, J., & Rauschenbach, B. S. (2003). Food choices among newly married couples: Convergence, conflict, individualism, and projects. *Appetite, 40*, 25-41.

Bryk, A. S., & Raudensubh, S. W. (1992). *Hierarchical Linear Models: Applications* *and Data Analysis Methods.* Newbury Park, CA: Sage.

Campbell, L., & Kashy, D. A. (2002). Estimating actor, partner, and interaction effects for dyadic data using PROC MIXED and HLM: A user-friendly guide. *Personal Relationships, 9*, 327-342.

Carmalt, J. H., Cawley, J., Joyner, K., & Sobal, J. (2008). Body weight and matching with a physically attractive romantic partner. *Journal of Marriage and Family, 70*(5), 1287-1296.

Cawley, J. (2004). The impact of obesity on wages. *Journal of Human Resources, 39*, 2, 451-474.

Cawley, J. & Burkhauser, R. V. (2006). Beyond BMI: The value of more accurate measures of fatness and obesity in social science research. NBER Working Paper No. 12291 accessed 02/28/09 at http://www.nber.org/papers/w12291.pdf

Cawley, J., Joyner, K., & Sobal, J. (2006). Size matters: The influence of adolescents' weight and height on dating and sex. *Rationality and Society, 18*, 67-94.

Cook, W. L., & Kenny, D. A. (2005). The Actor-Partner Interdependence Model: A model of bidirectional effects in developmental studies. *International Journal of Behavioral Development, 29*(2), 101-109.

England, P., & Farkas, G. (1986). *Households, employment, and gender: A social, economic, and demographic view.* New York: Aldine Publishing Company.

Feingold, A. (1988). Matching for attractiveness in romantic partners and same-sex friends: A meta-analysis and theoretical critique. *Psychological Bulletin, 104*, 226-235.

Gailey, J. A., & Prohaska, A. (2006). "Knocking off a fat girl:" An exploration of hogging, male sexuality, and neutralizations. *Deviant Behavior, 27*, 31-49.

Garn, S. M., Sullivan, T. V., & Hawthorne, V. M. (1989a). Education level, fatness, and fatness differences in between husbands and wives. American Journal of

Clinical Nutrition, 50, 740-745.

Garn, S. M., Sullivan, T. V., & Hawthorne, V. M. (1989b). The education of one spouse and the fatness of the other spouse. *American Journal of Human Biology, 1*, 233-238.

Garner, D. M., Garkinkel, P. E., Scwartz, D., & Thompson, M. (1980). Cultural expectations of thinness in women. *Psychological Reports, 47*, 483-491.

Gillis, J. S., & Avis, W. E. (1980). The male-taller norm in mate selection. *Personality and Social Psychology Bulletin, 6*, 3, 396-401.

Gortmaker, S. L., Must, A., Perrin, J. M., Sobol, A. M., & Deitz, W. H. (1993). Social and economic consequences of overweight in adolescence and young adulthood. *New England Journal of Medicine 329*, 1008–12.

Green, S. K., Buchanan, D. R., & Heuer, S. K. (1984). Winners, Losers, and Choosers: A field investigation of dating initiation. *Personality and Social Psychology, 10*(4), 502-511.

Grilo, C. M., & Pogue-Geile, M. F. (1991). The nature of environmental influences on weight and obesity: A behavior genetic analysis. *Psychological Bulletin, 110*, 3, 520-537.

Hatfield, E., & Sprecher, S. (1986). *Mirror, Mirror: The Importance of Looks in Everyday Life.* Albany, NY: State University of New York Press.

Hebebrand, J., Wulftange, H., Goerg, T., Ziegler, A., Hinney, A., Barth, N., Mayer, H., & Remschmidt, H. (2000). Epidemic obesity: Are genetic factors involved via increased rates of assortative mating? *International Journal of Obesity, 24*, 345-353.

Homish, G. G., & Leonard, K. E. (2008). Spousal influence on general health behaviors in a community sample. *American Journal of Health Behavior, 32*, 6, 754-763.

Hout, M. (1982). The association between husbands' and wives' occupations in two-earner families. *American Journal of Sociology, 88*, 397-409.

Jacobsen, P., Torgerson, J. S., Sjöström, L., & Bouchard, C. (2007). Spouse resemblance in body mass index: Effects on adult obesity prevalence in the offspring generation. *American Journal of Epidemiology, 165*(1), 101-108.

Jeffery, R. W., & Rick, A. M. (2002). Cross-sectional and longitudinal associations between body mass index and marriage-related factors. *Obesity Research, 10*(8), 809-815.

Kalick, S. M., Hamilton, T. E. (1986). The matching hypothesis reexamined. *Journal of Personality and Social Psychology*, 51, 673-682.

Kalmijn, M. (1991). Status homogamy in the United States. *The American Journal of Sociology, 97*(2), 496-523.

Kalmijn, M. (1998). Intermarriage and homogamy: Causes, patterns, trends. *Annual Review of Sociology, 24*, 395-421.

Katzmarzyk, P. T., Hebebrand, J., & Bouchard, C. (2002). Spousal resemblance in the Canadian population: Implications for the obesity epidemic. *International Journal of Obesity, 26*, 241-246.

Kenny, D. A., Kashy, D. A., & Cook, W. L. (2006). *Dyadic Data Analysis.* New York: The Guilford Press.

Kurzban, R., & Weeden, J. (2005). HurryDate: Mate preferences in action. *Evolution and Human Behavior, 26*, 227-244.

Landry, D. J., & Forrest, J. D., (1995). How old are U.S. fathers? *Family Planning Perspectives, 27*, 4, 159-161.

Lichter, D. T., Carmalt, J. H., & Qian, Z. (2009). Changing Cultural Boundaries? Immigration, Generation, and Marital Endogamy among Hispanics. Under review.

Lipowicz, A. (2003). Effect of husbands' education on fatness of wives. *American Journal of Human Biology, 15*, 1-7.

Luke, D. A. (2004). *Multilevel Modeling.* Thousand Oaks, CA: Sage.

Maissey, D. S., Vale, E. L. E., Cornelissen, P. L., & Tovée, M. J. (1999). Characteristics of male attractiveness for women. *The Lancet, 353*, 1500.

Mascie-Taylor, C. G. N. (1987). Assortative mating in a contemporary British population. *Annals of Human Biology, 14*, 59-68.

McNulty, J. K., Neff, L. A., & Karney, B. R. (2008). Beyond initial attraction: Physical attractiveness in newlywed marriage. *Journal of Family Psychology, 22*, 135-143.

Meyler, D., Stimpson, J. P., & Peek, M. K. (2007). Health concordance within couples: A systematic review. *Social Science & Medicine, 64*, 2297-2310.

Monden, C. (2007). Partners in health? Exploring resemblance in health between partners in married and cohabiting couples. *Sociology of Health and Illness, 29*, 3, 391-411.

Murstein, B. I. (1972). Physical attractiveness and marital choice. *Journal of Personality and Social Psychology, 22*, 8-12.

Mukhopadhyay, S. (2008). Do women value marriage more? The effect of obesity on cohabitation and marriage in the USA. *Review of Economics of the Household, 6*, 111-126.

Newsom, J. T. (2002). A multilevel structural equation model for dyadic data. *Structural Equation Modeling 9*, 431-447.

Ogden, C. L, Carroll, M. D., Curtin, L. R., McDowell, M .A., Tabak, C. J., & Flegal, K. M. (2006). Prevalence of overweight and obesity in the United States, 1999-2004. *Journal of the American Medical Association, 295,* 1549-1555.

Pennock-Román, M. (1984). Assortative marriage for physical characteristics in newlyweds. *American Journal of Physical Anthropology, 64*, 185-190.

Polivy, J., Garner, D. M., & Garfinkel, P. E. (1986). Causes and consequences of the current preference for thin female physiques. In Herman, C.P., Zanna, M., & Huggins, E. T. (Eds) *Physical appearance, stigma, and social behavior* (pp. 89-112). Hillsdale, NJ: Erlbaum.

Powell, A. D., & Kahn, A. S. (1995). Racial differences in women's desires to be thin. *International Journal of Eating Disorders, 17*, 191- 195.

Puhl, R. & Brownell, K. D. (2001). Bias, discrimination, and obesity. *Obesity Research, 9*, 788-805.

Rauch, K. L. (2004). *Human mate selection: An exploration of assortative mating preferences.* Unpublished manuscript.

Roberts, J. V., & Herman, C. P. (1986). The psychology of height: An empirical review. In C. P. Herman, M. Zanna, & E. T. Huggins, (Eds.) *Physical appearance, stigma, and social behavior* (pp. 89-112). Hillsdale, NJ: Erlbaum.

Salces, I., Rebato, E., & Susanne, C. (2004). Evidence of phenotypic and social assortative mating for anthropometric and physiological traits in couples from the Basque country (Spain). *Journal of Biosocial Science, 36*, 235-250.

Schafer, R. S., & Keith, P. M. (1990). Matching by weight in married couples: A life cycle perspective. *The Journal of Social Psychology, 130*, 5, 657-664.

Shackelford, T. K., Schmitt, D. P., & Buss, D. M. (2005). Universal dimensions of human mate preferences. *Personality and Individual Differences, 39*, 447-458.

Silventoinen, K., Kaprio, J., Lahelma, E., Viken, R. J., & Rose, R. J. (2003). Assortative mating by body height and BMI: Finnish twins and their spouses. *American Journal of Human Biology, 15*, 620-627.

Singh, D. (1993). Is thin really beautiful and good? Relationship between waist-to-hip ratio (WHR) and female attractiveness. *Personality and Individual Differences,* *16*, 123-132.

Singh, D. (1995). Female judgment of male attractiveness and desirability for relationships: Role of waist-to-hip ratio and financial status. *Journal of Personality and Social Psychology, 69*, 6, 1089-1101.

Singh, D. & Young, R. K. (1995). Body weight, waist-to-hip ratio, breasts, and hips: Role in judgments of female attractiveness and desirability for relationships. *Ethology and Sociobiology, 16*, 483-507.

Smith, K., & Zick, C. L. (1994). Linked lives, dependent demise? Survival analysis of husbands and wives. *Demography, 31*, 81-93.

Sobal, J. (1991). Obesity and socioeconomic status: A framework for examining relationships between physical and social variables. *Medical Anthropology, 13*, 231-247.

Sobal, J. (2005). Social consequences of weight bias by partners, friends, and strangers. In K. D. Brownell, R. M. Puhl, M. B. Schwartz, & L. Rudd (Eds.), *Weight Bias: Nature, Consequences, and Remedies* (pp. 150- 164). New York: The Guilford Press.

Sobal, J., & Bursztyn, M. (1998). Dating people with anorexia nervosa and bulimia nervosa: Attitudes and Beliefs of University Students. *Women and Health, 27*, 73-88.

Sobal, J., Nicolopoulos, V., & Lee, J. (1995). Attitudes about overweight and dating among secondary school students. *International Journal of Obesity, 19*, 376-381.

Sobal, J., Rauschenbach, B., & Frongillo, E. A. (2003). Marital status changes and body weight changes: A U.S. longitudinal analysis. *Social Science and Medicine, 56*, 1543-1555.

Sobal, J., & Stunkard, A. J. (1989). Socioeconomic status and obesity: A review of the literature. *Psychological Bulletin, 105*, 2, 260-275.

Speakman, J. R., Djafarian, K., Stewart, J., & Jackson, D. M. (2007). Assortative mating for obesity. *American Journal of Clinical Nutrition, 86*, 316-323.

Sprecher, S. (1998). Social exchange theories and sexuality. *Journal of Sex Research, 35*, 1, 32-43.

Spuhler, J. N. (1968). Assortative mating with respect to physical characteristics. *Eugenics quarterly, 15*, 2, 128-140.

Stevens, G., Owens, D., & Schaefer, E. C. (1990). Education and attractiveness in marriage choices. *Social Psychology Quarterly, 53*, 1, 62-70.

Swami, V., & Tovée, M. J. (2009). Big beautiful women: The body size preferences of male fat admirers. *Journal of Sex Research, 46*, 1, 89-96.

Tovée, M. J., & Cornelissen, P. L. (2001). Female and male perceptions of female physical attractiveness in front-view and profile. *British Journal of Psychology, 92*, 391-402.

Tovée, M. J., Reinhardt, S., Emery, J. L., & Cornelissen, P. L. (1998). Optimum body-mass index and maximum sexual attractiveness. *Lancet, 352*, 548.

Umberson, D. (1987). Family status and health behaviors: Social control as a dimension of social integration. *Journal of Health and Social Behavior, 28*, 306-319.

U.S. Census Bureau, 2007 American Community Survey [datafiles: R1205: Median age at first marriage for men; R1204: Median age at first marriage for women].

Walster, E., Berscheid, E., & Walster, G. W. (1976). New directions in equity research. In L. Berkowitz & W. Walster (Eds.), *Advances in Experimental Social Psychology* (Vol.
9, pp. 1-42). New York: Academic Press.

Weng, H. H., Bastian, L. A., Taylor, D. H., Moser, B. K., & Ostbye, T. (2004).

Number of children associated with obesity in middle-aged women and men: Results from the Health and Retirement Study. *Journal of Women's Health, 13*, 85-91.

Wiseman, C. V., Gray, J. J., Mosimann, J. E., & Ahrens, A. H. (1992). Cultural expectations of thinness in women: An update. *International Journal of Eating Disorders, 11*, 85-89.

World Health Organization. (1997). Obesity: Preventing and managing the global epidemic. Geneva: World Health Organization.

CHAPTER 3: BODY WEIGHT, PHYSICAL ATTRACTIVENESS, AND ROMANTIC PARTNER MATCHING

Abstract

Attribute matching and attribute trade are two perspectives used to explain mate selection. This study investigated patterns of matching and trade among heterosexual young adult romantic partners. In particular, the study examined associations between the body weight of one partner and the physical attractiveness of the other partner using Add Health Romantic pair data (*N* = 1,405 couples). We found obese individuals, relative to healthy weight individuals, were less likely to have physically attractive partners, with this disadvantage greater for women than men, and greater for white women than black women. Additional years of education, a more attractive personality, and better grooming increased the probability of having a physically attractive partner and offset the disadvantage of obesity for some individuals. Unique to this study, we found women, like men, trade education for their partners' physical attractiveness. Despite evidence of attribute trade, matching with respect to physical characteristics was the dominant mate selection pattern.

Introduction

Marriage and childbearing are preceded by the "matching" of men and women in a relationship market. The matching of romantic or sexual partners is not random. Instead, individuals seek partners based on individual preferences (England & Farkas, 1986). It is well documented that both men and women prefer physically attractive partners (Bersheid & Walster, 1974; Buss, Shackelford, Kirkpatrick & Larsen, 2001). Physical attractiveness is associated with positive attributes like intelligence, kindness, positive character, and better life outcomes (Hatfield & Sprecher, 1986). Thus, individuals may select partners based on physical attractiveness (including observable characteristics of attractiveness such as body weight) because they believe it to be a signal (accurate or not) of these and other desired attributes that are more difficult to assess (Kurzban & Weeden, 2005).

Despite universal preference for a physically attractive romantic partner (Buss & Barnes, 1986; Shackelford, Schmitt, & Buss, 2005), mate selection studies reveal that most individuals end up with a partner of similar physical attractiveness to their own (Feingold, 1988; Stevens, Owens, & Schaefer, 1990). Two types of studies - matching studies and exchange studies - have documented attractiveness homogamy (similarity) within couples. Matching studies focus on the degree to which partners are similar on physical attractiveness and report an average intracouple attractiveness correlation of .39 (for a review see Feingold, 1988). Exchange studies focus on the gender-specific trade of women's attractiveness for men's education and find a small positive association between wives' physical attractiveness and husbands' educational attainment (Elder, 1969; Taylor & Glenn, 1976; Udry, 1977).

Motivated by the issue of matching for partner attractiveness, this study examined the extent to which the probability of being matched with a physically attractive partner varied with one important component of appearance: body weight.

Body Weight and Physical Attractiveness

Body weight is considered a critical aspect of physical attractiveness, especially for women (Kurzban & Weeden, 2005; Singh & Young, 1995; Tovée & Cornelissen, 2001). Perceptions of attractiveness and ideal body weight vary across cultures and over time, but in contemporary United States, the body weight considered optimally attractive in women is that within a "healthy" range of body mass index (BMI) and corresponding to a curvaceous waist-to-hip ratio (Singh, 1993; Singh &

Young, 1995; Tovée, Reinhardt, Emery, & Cornelissen, 1998).[36] Although the Duchess of Windsor once quipped, "You can never be too rich or too thin" (Polivy, Garner, & Garfinkel, 1986, p. 92), whether men prefer underweight women is a contested issue. Some studies have documented a preference for "thinner" but not underweight women (Fallon & Rozin, 1985) whereas others have documented a preference for underweight female figures by white men (Thompson, Sargent, & Kemper, 1996). Several studies have reported slim figures are only preferred when they are contrasted with fat figures (e.g., Singh & Young, 1995), and others have found that underweight figures are not attractive (Singh, 1993).

Black women and men also judge healthy body weight and a curvaceous body shape for women as most attractive (Singh, 1994). Some studies have shown that in comparison with white men, black men prefer larger female bodies but not necessarily bodies that are overweight (Thompson, Sargent, & Kemper, 1996). Cross-cultural attractiveness research has documented some preference for heavier female figures and no preference for thinner figures among non-Western cultures (Furnham, Moutafi, & Baguma, 2002; Wetsman & Marlowe, 1999).

Ideal body weight and its importance to attractiveness also varies by gender. Overall, women's perceptions of a man's attractiveness depends less on his body weight and physical characteristics than on his personality and status (Braun & Bryan, 2006). Some evidence has shown that body shape is important in assessing men's attractiveness. Men's physical attractiveness is associated with a muscular or V-shaped torso (a narrow waist and broad chest and shoulders) (Braun & Bryan, 2006; Maisey, Vale, Cornelissen, & Tovée, 1999) and tubular-shaped hips and waist (Singh, 1995). Notably, Singh found that both a tubular shape *and* financial status accounted for men's attractiveness.

[36] A healthy-weight BMI is one between 18.5 and 25. A curvaceous waist-to-hip ratio is .7.

Obesity and Stigma

In contemporary U.S. culture, obesity is a stigmatized condition (Brownell, Puhl, Schwartz, & Rudd, 2005; Sobal, 2004). Studies consistently have shown that obese individuals are stereotyped as lazy, stupid, mean, and lacking self-discipline (Polivy, Garner, & Garfinkel, 1986; Puhl & Brownell, 2001). This is one reason obese individuals (especially obese women) are seen as less desirable dating partners (Sobal & Bursztyn, 1998; Sobal, Nicolopoulos, & Lee, 1995). The stigma of obesity varies across cultures and genders (Sobal, 2004). Averett and Korenman (1999) suggest that differential acceptable body size norms are responsible for the differences in stigma of obesity. In the United States, norms for men's acceptable weight are appreciably larger than women's (Maisey et al., 1999; Tovée et al., 1998). Consequently, obese women face greater stigmatization than do obese men (Sobal, 2004).

Norms for acceptable body size also vary by race. Black women are generally heavier than white women (Ogden, Carroll, Curtin, McDowell, Tabak, & Flegal, 2006; Yates, Edman, & Aruguete, 2004), yet are more satisfied with their bodies (Kemper, Sargent, Drane, Valois, Hussey, & Leatherman, 1994; Yates, Edman, & Aruguete, 2004) and have more congruent body size ideals for themselves than white women (Powell & Kahn, 1995; Rucker & Cash, 1992). Black men are more willing to date overweight women than are white men (Powell & Kahn, 1995) and obesity lowers the probability of marriage twice as much for white women than black women (Averett & Korenman, 1999). Consequently, obese white women face the greatest stigma for their physical appearance (Sobal, 2004).

Using Add Health Romantic Pair data, we sought to make two contributions to the literature about physical attractiveness and mate selection behavior. First, we extended previous studies of matching and exchange by considering the association between physical attractiveness and additional characteristics presumed to be desired in a mate (e.g., personality, intelligence, good grooming), paying particular attention to obesity.[37] In the present study we investigated whether and how much obesity inhibited young adults from matching with a physically attractive partner and whether other desired characteristics like education, grooming, or personality offset some of the disadvantage of obesity. Importantly, our inclusion of multiple characteristics in models of partner attractiveness allowed us to simultaneously examine patterns of both matching and exchange.

Second, we examined characteristics associated with having a physically attractive partner for *both* men and women. Most previous studies focused only on the characteristics associated with partner attractiveness for men. Men are found to rate the importance of having a physically attractive partner more highly than do women, but the importance of men's physical attractiveness to women is increasing (Buss, et al., 2001). We examined correlates of having a physically attractive partner using an identical set of characteristics for men and women and tested for gender differences in mate selection processes. Most previous exchange studies failed to test for gender differences, despite having gender-specific hypotheses (e.g., Taylor & Glenn, 1976).

Matching and Exchange in the Market for Physically Attractive Partners

Scholars have developed several formulations of a matching perspective to explain how men and women sort on physical attractiveness (e.g., Berscheid, Dion, Walster, & Walster, 1971; Kalick & Hamilton, 1986). One formulation is Murstein's (1972) mating market perspective whereby matching for physical attractiveness is presumed to result from competition for attractive partners in a relationship market. When women and men seek a physically attractive mate, highly attractive individuals

[37] Certainly, body weight and physical attractiveness are not the only criteria by which individuals select mates. Mate preference studies have consistently found that men and women rank attributes such as kindness, an exciting personality, and intelligence higher than attractiveness (Buss & Barnes, 1986; Buss, Shackelford, Kirkpatrick, & Larsen, 2001).

pair off, leaving less attractive individuals to either partner amongst themselves or remain unattached. This process generates a positive correlation between partner's attractiveness. Because body weight is a component of physical attractiveness, particularly for women (Singh & Young, 1995), one partner's body weight (especially a woman's) should be correlated with the other partner's attractiveness. From this market matching perspective, we hypothesized that, all else being equal, obese individuals would be less likely to have a physically attractive partner. Because the stigma of obesity is stronger for women than men, and especially for white women (Sobal, 2005), we hypothesized that the disadvantage of obesity would be stronger for women than men and strongest for white women.

To explain the association between physical attractiveness and other characteristics, scholars have formulated perspectives that emphasize the trade of different attributes in mating markets (e.g., Becker, 1976). According to exchange perspectives, men and women trade a variety of attributes in a relationship market in order to obtain the "best mate" possible (England & Farkas, 1986). In a market for physically attractive partners, individuals are presumed to have a "mate value" based on their *bundle* of desirable and undesirable characteristics. This bundle is used to obtain the most attractive mate possible. Desirable physical characteristics like attractiveness, healthy body weight (Singh & Young, 1995), and good grooming (Brown, Cash, & Noles, 1986) are presumed to increase an individual's mate value. Other desirable characteristics presumed to increase an individual's mate value include education, income, intelligence, an exciting personality, and emotional expressiveness (Braun & Bryan, 2006; Shackelford et al., 2005). Undesirable characteristics, like obesity, are presumed to decrease an individual's mate value. Exchange perspectives permit low values on one characteristic to be offset by high values on another characteristic (Stevens et al., 1990). Based on exchange perspectives, we hypothesized that, all else being equal, obese individuals would have a lower probability of matching with a physically attractive partner but that other desired characteristics like education, grooming, and personality would increase the probability of having a physically attractive partner and therefore could potentially offset some of the negative effects of obesity.

Some characteristics are considered to be more desirable to one gender than the other. For example, men place greater emphasis on physical attractiveness, whereas women place greater value on future earning potential and emotional expressiveness (Braun & Bryan, 2006; Shackelford et al., 2005). Theories of evolutionary biology suggest that men and women are "hardwired" differently in ways that affect their preferences for different characteristics (Buss, 1989). Social structure theory suggests that gender-differentiated preferences for romantic partners stem from the structural positions men and women occupy in the household and labor market (Eagly & Wood, 1999; England & Farkas, 1986). As women's and men's roles within society change, so do their preferences in a mate (Eagly & Wood, 1999). Sweeny and Cancian (2004) argue that women's improved position in the labor market increases men's emphasis on women's economic characteristics. Conversely, Press (2004) argues that women's increasing economic independence has decreased women's emphasis on men's economic value and increased their requirements for physical attractiveness in men.

With the exception of Stevens et al. (1990), the handful of studies that have examined the association between women's attractiveness and men's educational attainment fail to consider men's physical attractiveness, a characteristic associated with men's educational attainment. Stevens and colleagues addressed this limitation by examining the joint influence of husbands' education and attractiveness on wives' education and attractiveness, and vice versa. Based on a small and select sample of newlywed couples, they found significant associations between husbands' attractiveness and wives' attractiveness, and between wives' education and husbands' education. They found that neither men nor women traded education for attractiveness or traded attractiveness for education, as evidenced by nonsignificant associations between these variables when spouses' own education and attractiveness were controlled. They concluded that matching was the dominant process in mate selection, and that previous studies had overstated the prevalence of gender-specific trade by simply examining the association between women's attractiveness and men's education.

Given the Stevens et al. (1990) study's lack of power to detect significant statistical effects, it remains an unresolved empirical question whether individuals are able to use economic characteristics (e.g., education and income), in addition to physical characteristics, to obtain a physically attractive partner. In this study we examined a bundle of attributes hypothesized to be associated with having a physically attractive partner using a large sample of young adult romantic couples. We included several control variables in our analyses. We controlled for age because it is associated with body weight (Movahed, Ahmadi-Kashani, Seyed, & Kasravi, 2004). Race-ethnicity was controlled because perceptions of weight and attractiveness vary by race-ethnicity (Thompson, Sargent, & Kemper, 1996). We included a measure of relationship duration to control for partner similarity in weight and attractiveness due to shared lifestyle and living habits (Bove, Sobal, & Rauschenbach, 2003). Because preference for physical attractiveness may vary by type of relationship (Regan, Sprecher, Christopher, & Cate, 2000) we controlled for couples' union status.

Method

Data

We used data from Wave 3 of the National Longitudinal Survey of Adolescent Health (Add Health). The Add Health Wave 1 baseline was a nationally representative sample of U.S. students in grades 7 to 12 in the 1994-1995 academic year. Most of the 20,745 Wave 1 respondents who completed in-home questionnaires were aged 12-18. A total of 15,197 original Wave 1 respondents completed Wave 3 in-home interviews (73%) in 2001 - 2002 and answered questions about past and current romantic and sexual relationships.

Unique to Add Health is the Romantic Pair data that collected information from roughly equal proportions (about one-third each) of 1,507 married, cohabiting, and dating partners of Wave 3 respondents. Most Wave 3 respondents were aged 18 – 24. Wave 3 respondents reporting current romantic relationships of at least 3 months duration with opposite-sex partners who were at least 18-years-old were asked to recruit their partners for participation in the Wave 3 interview. These Romantic Pair data contain key information about *both* partners relevant to the study of romantic, opposite-sex pairing, including measures of health and physical appearance (e.g., measured weight and height, physical attractiveness, and grooming). We excluded 102 couples with pregnant female partners (7% of the sample) because of the temporary weight gain associated with pregnancy. Individuals were the unit of analysis, and our analytic sample consisted of 1,405 men and 1,405 women paired with each other in romantic relationships.

Addressing Missing Data

Although there were little missing data for any particular variable, analyses using only complete cases would have omitted nearly 30% of the sample and could have introduced bias into the analyses (Acock, 2005). Nine percent of the sample (*n* =

122 couples) was missing data about measured height and/or weight used to calculate BMI. We substituted self-reported height and/or weight where available (100 substitutions for 122 missing cases). To address all remaining item nonresponse, we used multiple imputation techniques described in Acock (2005) and Allison (2002). We applied a Markov chain Monte Carlo (MCMC) method appropriate for data with an arbitrary missing pattern and robust to departures from multivariate normality when amounts of missing data are not large (Yuan, 2000). We report results from logistic regression analyses conducted using PROC MI and PROC MIANALYZE procedures in SAS 9.1. As a quality check, we compared the MI results reported here to both results using complete case analysis and to MI results where all missing measured values for height and/or weight were imputed along with all other missing values, and the results were not substantively different.

Variable Definitions

Dependent Variable

Our dependent variable, having a physically attractive partner, was derived from Add Health interviewer ratings of respondent physical attractiveness. In response to the question, "How physically attractive is the respondent?" interviewers recorded values ranging from 1 (*very unattractive*) to 5 (*very attractive*). The dependent variable equals 1 if a respondent's *partner* was rated *very attractive* or *attractive* and 0 if the respondent's partner was rated *about average, unattractive*, or *very unattractive*. We also included a continuous version of this measure as an independent variable indicating each *respondent's* attractiveness.

Main Covariate

Body mass index (BMI) is a measure of body fat calculated as weight in kilometers divided by height in meters squared. We calculated BMI from weight and height measured by Add Health interviewers. Indicator variables for clinical weight classification were created (World Health Organization, 1997) and obese was defined as a BMI greater than or equal to 30, overweight a BMI greater than or equal to 25 but less than 30, healthy weight was a BMI greater than or equal to 18.5 but less than 25, and underweight a BMI less than 18.5. Healthy weight was our reference category.

Additional Covariates

Grooming was interviewer-rated and ranged from 1 (*very poorly groomed*) to 5 (*very well groomed*). Education indicated the highest year in school completed and ranged from 6 (*6th grade*) to 22 (*5 or more years of graduate school*). Personal income from all sources, before taxes, in the previous year ranged from 0 to $500,909. We used the log of personal income in our analyses. Cognitive ability was measured using percent rank values (range was 0 to .94) from the Add Health Picture Vocabulary Test (AH-PVT) that measures receptive or hearing vocabulary (Dunn & Dunn, 1981). Personality attractiveness was interviewer-rated and ranged from 1 (*very unattractive*) to 5 (*very attractive*). Emotional supportiveness was derived from three questions asking respondents how often they "notice and respond to partner's mood changes," "laugh at their partner's jokes, even when they are not funny," and are "the first to apologize in an argument with their partner." Responses to each question ranged from 0 (*never/hardly ever*) to 4 (*most of the time/every time*), and were summed into an emotional supportiveness index ranging from 0 to 12, with higher scores indicated greater emotional supportiveness provided to one's partner.

Control Variables

Control variables included age in years, race-ethnicity (non-Hispanic white, non-Hispanic black, or "other race" which includes Hispanic), relationship duration (in months), and union status (dating, cohabiting, or married).

Analytic Approach

Our goal was to estimate the probability of having a physically attractive partner as a function of each respondent's body weight, controlling for additional measures of appearance, social status, personality, and sociodemographic characteristics. We estimated logit models where the binary dependent variable equaled 1 if the respondent had a physically attractive partner. The primary independent variable was BMI. We entered BMI into regression equations as a set of 3 dummy variables (obese, overweight, and underweight), to test the hypothesis that obese individuals, relative to healthy weight individuals, would have a lower probability of having a physically attractive partner. We completed the logistic regression analyses in two steps. First, we regressed the dependent variable (physically attractive partner) onto each independent variable separately, controlling for age, race-ethnicity, relationship status, and duration of the relationship. This step allowed us to examine patterns of association (i.e., matching or exchange) between each independent variable and the dependent variable. Second, we regressed the dependent variable onto all of the independent variables simultaneously, including the control variables. This step allowed us to examine whether the association between underweight, overweight, or obesity and the probability of having a physically attractive partner was independent of the other characteristics. This step also permitted us to examine any offsetting effects of the other characteristics on our BMI dummy variables (evidence of exchange).[38]

We estimated models for women and men separately to examine whether body weight is more important for women's ability to obtain a physically attractive partner than for men's. In addition, we estimated models for men and women pooled in order

---

[38] Because several independent variables were moderately correlated (e.g., BMI, attractiveness, grooming, and personality attractiveness), we performed collinearity diagnostics and found that multicollinearity was not a substantial problem. Tolerance scores and variance inflation factors were never below .40 or above 2.50, respectively, indicating they are not problematic (Allison, 1999).

to test whether associations were significantly different for men and women. Specifically, we estimated models that included a main effect for gender and interaction terms between gender and each of the independent variables included in the model. We estimated models for white and black women separately, and for white and black men separately, to test the hypothesis that body weight is more salient for white women's ability to obtain a physically attractive partner than for black women's.

Identification Issues

Two obstacles to identification are selection bias and omitted variable bias. First, we had data only on individuals who were actually matched in longer duration relationships. If obesity is a disadvantage to being matched at all, or remaining in a relationship for three months or longer, obese individuals in our sample may be unrepresentative (i.e., they may be especially desirable on other characteristics). Also, eligible respondents who successfully recruited their partners may be different from those who did not recruit partners. As a result, our results may suffer from selection bias. One common solution is to use a Heckman Selection Correction (Heckman, 1979) but we lacked instruments in our data that affect the probability of being matched but not the attractiveness of the partner conditional on being matched. We considered the size of the selection bias by comparing mean BMI, percent obese, percent overweight, and percent underweight for the original Add Health respondents in the couples sample to the same statistics in both the full wave 3 Add Health sample and the sample of wave 3 respondents who were eligible for the couples sample but were not asked to (or failed to) recruit their romantic partners. Two-tailed Student's *t*-tests for independent samples revealed no evidence of selection bias at the .05 significance level.

Our second identification issue is omitted variable bias. Body weight is endogenous and, as a result, it may be correlated with variables unobserved by us.

One common solution is to use instrumental variables (Angrist & Krueger, 2001) but we did not have a powerful and valid instrument available for the whole sample. Thus, our results should be interpreted as correlations, not causal effects.

Results

Preliminary Validity Analyses

Key to our study is the validity of our measure of respondents' physical attractiveness. We conducted several analyses to examine the validity of physical attractiveness. First, physical attractiveness has been reported to have a curvilinear relationship with BMI; ratings of attractiveness are lower for underweight and overweight than for healthy weight individuals (Maisey et al., 1999; Tovée, Maisey, Emery, & Cornelissen, 1999). A plot of BMI-by-attractiveness did not reveal a consistent curvilinear pattern, probably due to the limited range of response options (1 to 5) for attractiveness. Cross-tabulations of BMI weight classifications (e.g., underweight, healthy weight, overweight, and obese) with attractiveness ratings revealed a somewhat curvilinear pattern but the results were inconclusive due to limited counts in some cells.

Second, physical attractiveness has been reported to be associated with women's BMI but not necessarily with men's (Maisey et al., 1999). We examined mean BMI for each attractiveness level and found that the two were negatively correlated and that the differences in mean BMI across attractiveness levels were significant for women. We also found that BMI was negatively correlated with interviewer ratings of physical attractiveness for both genders and, as expected, the correlation was modest for women ($r = -0.29$, $p < .001$) and weak for men ($r = -0.09$, $p < .0002$). These findings support our assumption that body weight is a more important component of physical attractiveness for women than for men.

Third, there is some indication that interviewers were matched demographically with the respondents. Since perceptions of physical attractiveness are culturally specific (Meland, 2002), mismatches between interviewers and respondents could increase the potential for bias in the ratings. To examine this possibility, we examined whether ratings of women's and men's physical attractiveness varied by interviewer race-ethnicity and gender or by respondent-interviewer matching on gender and race-ethnicity. There were 354 interviewers who conducted the couples sample interviews. We observed that 81% of respondents were interviewed by female interviewers and 72% of respondents were interviewed by non-Hispanic white interviewers. Furthermore, about 54% of the respondents had interviewers of the same gender, whereas about 69% of the respondents had interviewers of similar race-ethnicity (defined as non-Hispanic white or other). We found no significant difference in the mean ratings of women's and men's physical attractiveness by interviewer race-ethnicity, or by whether interviewers and respondents were matched on race-ethnicity. Male interviewers rated men lower in physical attractiveness than did female interviewers (there was no significant difference in ratings of women's attractiveness by gender). This may reflect some men's discomfort with describing other men as attractive.

Descriptive Statistics

Descriptive characteristics for women and men in our sample are shown in Table 3.1. A total of 43% of the women and 55% of the men had physically attractive partners. Mean attractiveness was higher for women than men. Mean BMIs for both women and men fell within the overweight range, and women had significantly lower BMI than the men. More men were overweight, more women were healthy weight and underweight, and the percent of obese women and men was not significantly different. Mean grooming was higher for women than for men. The average respondent had about one year of college education, and women reported more education than men. Mean income was higher for men than for women. There was no difference between women and men in cognitive ability measured by the AH-PVT. Women received higher ratings for personality attractiveness than did the men. Men reported greater emotional supportiveness provided to their partners than did women.

The sample varied in terms of race-ethnicity: 62% of women and 60% of men were non-Hispanic white, 16% of women and 18% of men were non-Hispanic black, and 22% of women and men reported other race-ethnicities. Mean age for men was 24, and women were significantly younger at 22. On average, the respondents had been in their present relationship for about 40 months. There were fewer married and cohabiting couples than there were dating couples.

Descriptive characteristics were also examined across relationship type. Several significant results are worth noting. More women in dating relationships had physically attractive partners compared to women in marriages. More men in dating relationships had physically attractive partners compared to men in cohabiting relationships. Married men and women had the largest mean BMI, and only dating women had a mean BMI in the healthy weight range.

Table 3.1. Distribution of Characteristics for Women (N = 1,405) and Men (N = 1,405) Across Relationship Type

	Women				Men			
Variables	All	D	C	M	All	D	C	M
Partner is physically attractive	0.43*	0.46_b	0.41	0.41_b	0.55	0.62_a	0.50_a	0.52
Body mass index	26.11*	24.92_{ab}	25.94_{ac}	27.59_{bc}	26.94	26.16_b	26.81_c	28.01_{bc}
Obese	0.23	0.16_{ab}	0.22_{ac}	$0.32b_c$	0.26	0.20_b	0.24_c	0.34_{bc}
Overweight	0.23*	0.19	0.24	0.25	0.32	0.29	0.34	0.34
Healthy weight	0.49*	0.59_{ab}	0.48_{ac}	0.39_{bc}	0.40	0.49_{ab}	0.39_{ac}	0.30_{bc}
Underweight	0.05*	0.06	0.06	0.04	0.02	0.01_a	0.03_a	0.02
Physical attractiveness	3.64*	3.78_a	3.53_a	3.59	3.44	3.47	3.40	3.46
Grooming	3.59*	3.68_a	3.46_{ac}	3.63_c	3.40	3.43	3.35	3.43
Years of education	13.00*	13.36_{ab}	12.73_a	12.86_b	12.77	13.17_{ab}	12.47_a	12.63_b
Log of personal income	7.89*	7.91	8.14_c	7.69_c	8.61	8.35_b	8.60	8.97_b
AH-PVT	0.47*	0.49_a	0.42_{ac}	0.48_c	0.48	0.48	0.47	0.51
Personality attractiveness	3.80*	3.85_a	3.72_a	3.81	3.61	3.60	3.58	3.65
Emotional supportiveness	6.86	6.65_b	6.82	7.09_b	7.30	6.96	7.33	7.65
Age	21.93*	21.32_{ab}	21.86_{ac}	22.73_{bc}	23.56	22.73_{ab}	23.54_{ac}	24.54_{bc}
Race-ethnicity								
Non-Hispanic White	0.62	0.56_{ab}	0.63_a	0.69_b	0.60	0.53_{ab}	0.61_{ac}	0.68_{bc}
Non-Hispanic Black	0.16	0.21	0.17_c	0.10_c	0.18	0.24_b	0.19_c	0.10_{bc}
Other race	0.22	0.23	0.20	0.21	0.22	0.23	0.20	0.22
Relationship duration	40.04	31.38_{ab}	34.70_{ac}	55.85_{bc}	40.49	32.50_b	35.01_c	56.23_{bc}
n	1,405	503	468	434	1,405	503	468	434

Note: D = dating, C = cohabiting, M = married. Values in the same row that share a subscript differ across relationship types at $p < .05$. *Difference between women and men is statistically significant at $p < .05$.

Characteristics Associated with Having a Physically Attractive Partner

Table 3.2 shows logistic regression estimates of the association between independent variables (including BMI categories) and the probability of having a physically attractive partner for women. The top panel in Table 3.2 (Panel A) shows the estimates from regression models where each independent variable (or set of dummy variables) was entered into the logistic regression separately (with control variables included in each model). The three leftmost columns show the results for all women. The other columns show the results for women in each relationship type (dating, cohabiting, and married). Panel A results for all women show that obese women had 56% (1 - .44) lower odds of having a physically attractive partner compared to healthy weight women. Greater physical attractiveness, better grooming, more education, higher cognitive ability, and a more attractive personality were individually associated with women's higher odds of having a physically attractive partner. These patterns were fairly consistent across relationships. The bottom panel in Table 3.2 (Panel B) shows estimates from models where all the variables in Panel A were entered into a logistic regression simultaneously (including the control variables). Panel B results for all women show that, independent of the other characteristics, obese women had 28% (1 - .72) lower odds of being matched with a physically attractive partner compared to their healthy weight counterparts. In the adjusted models, better grooming, additional years of education, and a more attractive personality were associated with women's higher odds of having a physically attractive partner. Panel B also shows that across relationship types sample sizes are small and none of the relationship-specific estimates are statistically significant (although the point estimate of the odds ratio in each case are similar to those of the pooled sample).

Table 3.2. Estimates of Women's Characteristics Predicting Being Matched with a Physically Attractive Male Partner

	All			Dating			Cohabiting			Married		
	β	*SE* β	e^{β}	β	*SE* β	e^{β}	β	*SE* β	e^{β}	β	*SE* β	e^{β}
	Panel A											
Body mass index												
Obese	-0.83***	0.15	0.44	-0.46*	0.23	0.63	-0.53	0.26	0.59	-0.73**	0.24	0.48
Overweight	-0.60	0.14	0.55	-0.25	0.24	0.78	0.06	0.24	1.06	-0.40	0.25	0.67
Underweight	0.12	0.25	1.13	-0.03	0.39	0.97	0.34	0.40	1.40	0.02	0.53	1.02
Physical attractiveness	0.59***	0.07	1.80	0.49***	0.11	1.63	0.70***	0.12	2.01	0.62***	0.13	1.86
Grooming	0.66***	0.08	1.93	0.46***	0.12	1.58	0.79***	0.14	2.20	0.82***	0.14	2.27
Years of education	0.14***	0.03	1.15	0.21***	0.05	1.23	0.07	0.05	1.07	0.14**	0.05	1.15
Log personal income	0.02	0.02	1.02	0.03	0.04	1.03	0.01	0.03	1.01	0.01	0.03	1.01
AH-PVT	0.49*	0.21	1.63	0.86*	0.35	2.36	-0.30	0.37	0.74	0.84*	0.37	2.32
Personality attractiveness	0.64***	0.07	1.90	0.59***	0.12	1.80	0.76***	0.13	2.14	0.62***	0.13	1.86
Emotional supportiveness	0.04*	0.02	1.04	0.05	0.04	1.05	0.03	0.04	1.03	0.07	0.05	1.07
	Panel B											
Body mass index												
Obese	-0.33*	0.16	0.72	-0.24	0.30	0.79	-0.23	0.28	0.79	-0.49	0.27	0.61
Overweight	0.01	0.15	1.01	-0.14	0.25	0.87	0.29	0.26	1.34	-0.19	0.27	0.83
Underweight	0.19	0.26	1.21	0.11	0.42	1.12	0.49	0.43	1.63	-0.29	0.58	0.75
Physical attractiveness	0.15	0.09	1.16	0.18	0.17	1.20	0.22	0.17	1.25	0.16	0.16	1.17
Grooming	0.32***	0.10	1.38	-0.01	0.17	0.99	0.45**	0.17	1.57	0.53**	0.17	1.70
Years of education	0.09*	0.03	1.09	0.17**	0.06	1.19	0.04	0.06	1.04	0.03	0.06	1.03
Log personal income	0.01	0.02	1.01	0.03	0.04	1.03	0.00	0.04	1.00	0.01	0.03	1.01
AH-PVT	-0.07	0.24	0.93	0.21	0.40	1.23	-0.80	0.43	0.45	0.32	0.43	1.38
Personality attractiveness	0.40***	0.09	1.49	0.42**	0.16	1.52	0.51***	0.16	1.67	0.34*	0.15	1.40
Emotional supportiveness	0.04	0.03	1.04	0.02	0.04	1.02	0.02	0.04	1.02	0.08	0.05	1.08

Note: Estimates are from logistic regressions using multiple imputation. e^{β} = exponentiated β. All models control for age, race-ethnicity, relationship duration, and union status. Panel A shows estimates where each characteristic was entered separately into models that include controls. Panel B shows estimates where all characteristics were entered simultaneously into one regression model that includes controls. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 3.3 shows analogous results for men. Panel A results for all men show that obese men had 27% (1 - .73) lower odds of having a physically attractive partner, compared to healthy weight men. Greater physical attractiveness, better grooming, more education, greater cognitive ability, and a more attractive personality were individually associated with men's higher odds of having a physically attractive partner. These patterns in men were fairly consistent across relationships and are consistent with the results presented for women in Table3.2. Panel B results for all men show that, adjusting for the other characteristics, obese men had 25% (1 - .75) lower odds of having a physically attractive partner compared to their healthy weight counterparts, but the association was not significant at conventional levels. Greater physical attractiveness, better grooming, and additional years of education were associated with men's higher odds of having a physically attractive partner in the adjusted models, whereas greater emotional supportiveness provided to one's partner was associated with lower odds of having a physically attractive partner. Notably, obese men in cohabiting relationships had 43% (1 - .57) lower odds of having a physically attractive partner.

Black-White Differences in the Probability of Having a Physically Attractive Partner

In our final analysis we examined the association of clinical weight classification with the probability of having a physically attractive partner separately for white and black women and then repeated this analysis for white and black men. Due to limitations in sample size, analyses could not be conducted separately by relationship type. The top half of Table 3.4 shows the logistic regression estimates of the effect of BMI categories and other characteristics on the probability of having a physically attractive partner in a sample restricted to white (N = 873) and black (N = 228) women (both non-Hispanic). Results reported in Table 3.4 come from analyses in which all of the respondent characteristics are included in the models simultaneously (i.e., analogous to results reported in Panel B in Tables 3.2 and 3.3). Focusing only on these adjusted models, we found none of the characteristics were significantly associated with having a physically attractive partner for black women. Conversely, obese white women had half the odds (1 - .50) of having a physically attractive partner, relative to their healthy weight counterparts. Good grooming and personality attractiveness were associated with white women's higher odds of having a physically attractive partner.

The bottom half of Table 3.4 shows analogous results for men in a sample restricted to white (N = 843) and black (N = 254) men (both non-Hispanic). In the fully adjusted models, we found no association between body weight and having a physically attractive partner for either white or black men. Greater income was associated with black men's higher odds of having a physically attractive partner. Greater physical attractiveness, good grooming, and additional years of education was associated with white men's higher odds of having a physically attractive partner.

Overall, these results supported our hypotheses about higher body weight and its association with having a less physically attractive partner. They also suggest that appearance characteristics, like grooming, have a greater influence than economic characteristics on the likelihood of having a physically attractive partner, as evidenced by the significance levels of individual variables representing these two broad sets of characteristics. Analogous models to those in Panel A and B (which combined the genders and included interactions between variables and gender) failed to reveal any significant differences in these effects for men and women. Consequently, although the magnitude and significance levels of different attributes on the likelihood of having a physically attractive partner differ for men and women, their general effects are similar using stringent tests of gender differences.

Table 3.3. Estimates of Men's Characteristics Predicting Being Matched with a Physically Attractive Female Partner

	All			Dating			Cohabiting			Married		
	β	$SE\ \beta$	e^{β}	β	$SE\ \beta$	e^{β}	β	$SE\ \beta$	e^{β}	β	$SE\ \beta$	e^{β}
	Panel A											
Body mass index												
Obese	-0.32*	0.14	0.73	-0.18**	0.24	0.84	-0.68**	0.25	0.51	-0.19	0.25	0.83
Overweight	0.02	0.13	1.02	0.13	0.22	1.14	0.01	0.22	1.01	-0.08	0.24	0.92
Underweight	0.14	0.39	1.15	1.08	1.11	2.94	0.83	0.61	2.29	-1.52	0.82	0.22
Physical attractiveness	0.65***	0.08	1.92	0.64***	0.14	1.90	0.65***	0.13	1.92	0.69***	0.15	1.99
Grooming	0.67***	0.08	1.95	0.56***	0.14	1.75	0.78***	0.15	2.18	0.68***	0.14	1.97
Years of education	0.18***	0.03	1.20	0.17***	0.05	1.19	0.14**	0.05	1.15	0.20***	0.05	1.22
Log personal income	0.01	0.02	1.01	0.05	0.03	1.05	0.03	0.03	1.03	-0.05	0.04	0.95
AH-PVT	0.87***	0.23	2.39	1.02**	0.37	2.77	0.43	0.41	1.54	1.17**	0.43	3.22
Personality attractiveness	0.54***	0.07	1.72	0.57***	0.13	1.77	0.44***	0.13	1.55	0.64***	0.13	1.90
Emotional supportiveness	0.00	0.02	1.00	-0.02	0.04	0.98	0.02	0.04	1.02	0.00	0.04	1.00
	Panel B											
Body mass index												
Obese	-0.29†	0.15	0.75	-0.14	0.25	0.87	-0.57*	0.27	0.57	-0.17	0.26	0.84
Overweight	-0.09	0.14	0.91	0.03	0.24	1.03	-0.09	0.23	0.91	-0.15	0.26	0.86
Underweight	0.43	0.41	1.54	1.15	1.13	3.16	1.07	0.64	2.92	-0.92	0.88	0.40
Physical attractiveness	0.31**	0.10	1.36	0.32	0.18	1.38	0.32	0.17	1.38	0.25	0.20	1.28
Grooming	0.33***	0.10	1.39	0.23	0.16	1.26	0.49**	0.19	1.63	0.32	0.29	1.38
Years of education	0.12***	0.03	1.13	0.13*	0.06	1.14	0.08	0.06	1.08	0.12*	0.06	1.13
Log personal income	0.00	0.02	1.00	0.04	0.04	1.04	0.03	0.04	1.03	-0.07	0.04	0.93
AH-PVT	0.28	0.27	1.32	0.39	0.43	1.48	-0.10	0.48	0.90	-0.61	0.50	0.54
Personality attractiveness	0.23	0.09	1.26	0.26	0.16	1.30	0.08	0.16	1.08	0.30	0.16	1.35
Emotional supportiveness	-0.02*	0.02	0.98	-0.04	0.04	0.96	0.01	0.04	1.01	-0.02	0.04	0.98

Note: Estimates are from logistic regressions using multiple imputation. e^{β} = exponentiated β. All models control for age, race-ethnicity, relationship duration, and union status. Panel A shows estimates where each characteristic was entered separately into models that include controls. Panel B shows estimates where all characteristics were entered simultaneously into one regression model that includes controls. $*p < .05$. $**p < .01$. $***p < .001$.

Table 3.4. Logistic Regression Estimates of Characteristics Predicting Being Matched with a Physically Attractive Partner: Results for White and Black Women and Men Only.

	White Women's Characteristics			Black Women's Characteristics		
	β	*SE* β	e^{β}	β	*SE* β	e^{β}
Body mass index						
Obese	-0.69 **	0.21	0.50	-0.22	0.36	0.80
Overweight	-0.29	0.19	0.75	0.06	0.36	1.06
Underweight	0.26	0.31	1.30	-1.29	1.22	0.28
Physical attractiveness	0.11	0.13	1.12	0.29	0.24	1.34
Grooming	0.28 *	0.12	1.32	0.47	0.26	1.60
Years of education	0.03	0.04	1.03	0.09	0.09	1.09
Log personal income	0.00	0.03	1.00	0.02	0.06	1.02
AH-PVT	0.03	0.33	1.03	-0.14	0.55	0.87
Personality attractiveness	0.57 ***	0.12	1.77	-0.04	0.22	0.96
Emotional supportiveness	0.06	0.03	1.06	-0.02	0.06	0.98

	White Men' Characteristics			Black Men's Characteristics		
	β	*SE* β	e^{β}	β	*SE* β	e^{β}
Body mass index						
Obese	-0.33	0.19	0.72	-0.19	0.35	0.83
Overweight	0.03	0.18	1.03	-0.59	0.33	0.55
Underweight	0.18	0.45	1.20	1.31	1.32	3.71
Physical attractiveness	0.41 **	0.14	1.51	0.34	0.23	1.40
Grooming	0.40 **	0.13	1.49	0.17	0.23	1.19
Years of education	0.11 *	0.04	1.12	0.14	0.09	1.15
Log personal income	-0.02	0.03	0.98	0.11 *	0.05	1.12
AH-PVT	0.21	0.35	1.23	-0.46	0.61	0.63
Personality attractiveness	0.16	0.12	1.17	0.17	0.20	1.19
Emotional supportiveness	-0.03	0.03	0.97	0.00	0.05	1.00

Note: Estimates are from logistic regressions using multiple imputation. e^{β} = exponentiated β. All models control for age, race-ethnicity, relationship duration, and union status. Panel A shows estimates where each characteristic was entered separately into models that include controls. Panel B shows estimates where all characteristics were entered simultaneously into one regression model that includes controls. $^{*}p < .05$. $^{**}p < .01$ $^{***}p < .001$.

Sensitivity Analyses

Sensitivity tests were conducted to examine the robustness of our findings. First, we substituted a continuous measure of BMI for the BMI weight classification categories in our models. Results (not shown) confirmed that heavier men and women were less likely to have a physically attractive partner in all models, consistent with the categorical analyses. Second, because physical attractiveness was rated by only one interviewer who may have had biased perceptions of attractiveness (Meland, 2002), we examined whether our results were robust to specifications based on interviewer characteristics. We reestimated our models on a sample restricted to (a) couples in which both partners had the same interviewer (N = 1,219 couples), (b) couples in which both partners had a same-gender interviewer (N = 720 couples), and (c) couples in which both partners had a similar-race interviewer (non-Hispanic white vs. other; N = 826 couples). The results for women were robust to these different specifications. For men, the coefficient for obese men failed to reach significance in specifications (a) and (c). Finally, we reestimated our models clustering on the identification numbers of the interviewers to account for dependence in error terms for respondents interviewed by the same individual. The results were robust to this specification.

Discussion

This study examined characteristics associated with a romantic partner's physical attractiveness (measured using interviewer ratings of physical attractiveness) in a sample of young adult, heterosexual, romantic couples. The study extended previous mate selection studies in two important ways. Rather than limiting the scope of respondent characteristics to education and attractiveness (e.g., respondent education with partner attractiveness), we examined how a variety of respondent characteristics (both separately and in combination with all other characteristics) were associated with partner attractiveness. We also extended previous mate selection studies by conducting parallel analyses for women and men. This allowed us to examine whether women and men trade the same characteristics for physical attractiveness. We also conducted parallel analyses for the different genders by race-ethnicity (i.e., for white and black women and men). This allowed us to examine whether patterns of matching and exchange varied by race within gender.

Focusing on body weight, we found that in comparison to their healthy weight counterparts, obese men and women displayed a lower probability of having a physically attractive romantic partner. This was especially pronounced for white women. These findings are consistent with our hypotheses and congruent with the literature documenting the importance of body weight to assessments of women's attractiveness (Singh & Young, 1995). Because healthy body weight is considered physically attractive, these findings support a matching perspective on assortative mating for physical attractiveness. Further supporting a matching perspective for assortative mating, we found that only for white women and men only, were physical characteristics (e.g., body weight, physical attractiveness and grooming) associated with having a physically attractive partner. Physical characteristics were not associated with having a physically attractive partner for black women or men.

We also found evidence that *both* women and men trade education for physical attractiveness in a romantic partner; to our knowledge this is the first time that a study has found that young adult women trade their economic status for men's attractiveness. The trading of education for physical attractiveness was especially pronounced for white men. Among black men, we found evidence that higher income was associated with partners' physical attractiveness. This suggests that education may be a better marker for socioeconomic status among white young adults, especially among white men, whereas among black men, income may be a more salient marker.

This is an area for future research.

Unlike many previous studies of mate selection, we formally tested whether the association of characteristics with the probability of having a physically attractive partner differed for women and men. We failed to find any significant gender differences in the characteristics associated with having a physically attractive partner. The results of our formal gender tests are notable considering the ubiquitous gender differences found in mate preference studies (e.g., Buss et al., 2001) and the focus on gender-specific trades examined among actual partners (e.g., Taylor & Glenn, 1976). These findings are consistent with Press's (2004) hypothesis that improvements in women's economic position may increase their demand for attractive men. Contemporary young adult U.S. women may feel optimistic about their economic position; whether they place less value on men's economic status or more value on men's attractiveness (or value both more) is an area of future research for social structure theorists.

Our findings suggest that gender differences in mate preferences may not be as great as they used to be. Consistent with this notion, Regan and Anupama (2003) found no gender differences in preferences among a small convenience sample of adolescents; however, it is possible that what individuals say they prefer in a romantic partner and who they actually select in real-life relationship markets differs significantly. Newer studies using data from "speed dating" events, where participants indicate their mate preferences prior to actually selecting dates (e.g., Eastwick & Finkel, 2008), will be useful for answering questions such as these. Another factor that could explain the muted gender differences is the fact this sample includes young adults, and that economic characteristics are less salient at younger ages. Additional research is needed to determine whether these patterns are reflective of age or generation.

The current research is not without its limitations. First, our sample of romantic couples is not representative of all young adults in romantic relationships nor is it representative of all young adult romantic couples, which limits the generalizability of this study's findings. The sample is comprised only of heterosexual couples and excludes romantic partnerships among gay and lesbian young adults. The sample is fairly homogenous in race-ethnicity and the small number of Hispanic, Asian, Native American, and Alaskan Native respondents had to be collapsed into one race-ethnic category of 'other' which precludes examination of important variations in weight and body image among men and women of different ethnicities (Yates, Edman, & Arquette, 2004). Another important aspect of our sample is that respondents were in their early twenties, which implies that many had yet to complete their education or reach their peak earning potential. Thus, our findings may understate the range of status-related exchanges that may occur later in life, when income and educational disparities have increased. Also, this study is historically situated in the early twenty first century and findings may not apply to other time periods when body weight and attractiveness were valued differently (Stearns, 1997).

Second, we measured physical attractiveness with one variable with a circumscribed range based on a rating provided by research interviewers. Only one interviewer rated the physical attractiveness of each respondent, which precluded us from determining the inter-rater reliability of our measure. It is possible that the ratings were affected by the interviewers' background characteristics (e.g., gender, race-ethnicity, and socioeconomic status) as well as the interview setting and information gained about the participant during the interview (Berscheid & Walster, 1974; Meland, 2002). We were able to examine differences in ratings across interviewer race-ethnicity and gender, and found no significant difference in the mean ratings of physical attractiveness by interviewer race-ethnicity, but did find a gender interviewer bias (male interviewers rated men lower on attractiveness than did female interviewers), and thus it may be possible that other culturally relevant factors (i.e., socioeconomic status of the interviewer) influenced ratings of respondent attractiveness. It is also possible that the attractiveness ratings were affected by the interviewers' BMI (Tovée, Emery, & Cohen-Tovée, 2000). We conducted several sensitivity analyses and our results were generally robust to these alternative specifications. Interviewer-rated measures of attractiveness have been used in previous studies using young adult or adolescent samples (Cawley, Joyner, & Sobal, 2006; Colabianchi, levers-Landis, & Borawski, 2005; Hill, 2002; Raley, Crissey, & Muller, 2007). Future research should consider using partner-rated assessments of physical attractiveness. To the extent that "beauty is in the eye of the beholder," research that relies on interviewer ratings of attractiveness may understate important matching or exchange interactions that may occur.

Third, our primary independent variable, body weight, was based on BMI which was calculated using height and weight that was measured by the interviewers. Using measured BMI over self-reported BMI reduces potential for bias. However, BMI has some limitations worth noting. First, BMI does not capture muscle mass and may systematically overestimate fatness in men (Cawley & Burkhauser, 2006). Our lack of a consistent finding for obesity in men may be an artifact of BMI. Second, the BMI has been shown to be an unreliable indicator of fatness in women of different race-ethnicities (Daniels, Khoury, & Morrison, 1997). Our lack of a significant finding for obese Black women may also be an artifact of our measure. Third, the BMI ignores fat distribution, or body shape, which is associated with physical attractiveness in men and women, independent of body weight (Singh, 1993; Maisey et al., 1999). We lacked data about respondents' body shape measurements thus our results may understate the effect of obesity on the ability to match with a physically attractive partner.

Finally, our models may suffer from omitted variables bias because we were unable to correct for unobserved heterogeneity using a valid and powerful instrument. As a result, our findings should be interpreted as correlations and not as causal effects.

Previous studies examined either matching for physical attractiveness or the trade of men's education for women's attractiveness (the exception being Stevens et al., 1990). This study examined multiple characteristics presumed to be associated with a physically attractive partner, either through matching or exchange. Overall, we found that matching for physical attractiveness dominated mate selection in our young adult sample; the probability of having a physically attractive partner was much more strongly correlated with appearance (i.e., BMI, grooming, and physical attractiveness) than with socioeconomic status (i.e., education and income). For women, BMI was the characteristic most predictive of having an attractive partner. In addition to an overwhelming matching tendency, this study also found evidence of a new trade: women's higher education for men's physical attractiveness. Social structure and evolutionary scholars may need to refine their perspectives and methods to accommodate nontraditional mating patterns, and to identify whether these patterns are specific to recent cohorts or younger couples.

REFERENCES

Acock, A. C. (2005). Working with missing values. *Journal of Marriage and Family, 67*, 1012-1028.

Allison, P. (1999). *Logistic regression using the SAS System: Theory and Application.* Cary, NC: SAS Institute, Inc.

Allison, P. (2002). *Missing data*. Thousand Oaks, CA: Sage.

Angrist, J. B., & Krueger, A. B. (2001). Instrumental variables and the search for identification: From supply and demand to natural experiments. *Journal of Economic Perspectives, 15*, 69-85.

Averett, S. L., & Korenman, S. (1999). Black-white differences in social and economic consequences of obesity. *International Journal of Obesity, 23*, 166-173.

Becker, G. S. (1976). *The economic approach to human behavior.* Chicago, IL: The University of Chicago Press.

Bersheid, E., Dion, K., Walster, E., & Walster, G. (1971). Physical attractiveness and dating choice: A test of the matching hypothesis. *Journal of Experimental Social Psychology, 7*, 173-189.

Berscheid, E., & Walster, E. (1974). Physical attractiveness. In L. Berkowitz (Ed.), *Advances in experimental social psychology: Vol. 7.* New York: Academic Press.

Bove, C. F., Sobal, J., & Rauschenbach, B. S. (2003). Food choices among newly married couples: Convergence, conflict, individualism, and projects. *Appetite, 40*, 25-41.

Braun, M. F., & Bryan, A. (2006). Female waist-to-hip and male waist-to-shoulder ratios as determinants of romantic partner desirability. *Journal of Social and Personal Relationships, 23*, 805-819.

Brown, T. A., Cash, T. F., & Noles, S. W. (1986). Perceptions of physical attractiveness among college students: Selected determinants and methodological matters. *Journal of Social Psychology, 126,* 305-316.

Brownell, K. D., Puhl, R. M, Schwartz, M. B., & Rudd, L. (Eds.). (2005). *Weight bias: Nature, consequences, and remedies.* New York: The Guilford Press.

Buss, D. M. (1989). Sex differences in human mate selection preferences: Evolutionary hypotheses tested in 37 cultures. *Behavioral and Brain Sciences, 12*, 1-49.

Buss, D. M. (1994). *The evolution of desire: Strategies of human mating*. New York: Harper Collins.

Buss, D. M. & Barnes, M. (1986). Preferences in human mate selection. *Journal of Personality and Social Psychology, 50*, 559-570.

Buss, D. M., Shackelford, T. K., Kirkpatrick, L. A., & Larsen, R. J. (2001). A half century of mate preferences: The cultural evolution of values. *Journal of Marriage and Family, 63*, 491-503.

Cawley, J., & Burkhauser, R. V. (2006). Beyond BMI: The value of more accurate measures of fatness and obesity in social science research. NBER Working Paper No. 12291 accessed 02/28/09 at http://www.nber.org/papers/w12291.pdf

Cawley, J., Joyner, K., & Sobal, J. (2006). Size matters: The influence of adolescents' weight and height on dating and sex. *Rationality and Society, 18*, 67-94.

Colabianchi, N., levers-Landis, C. E., Borawski, E. A. (2006). Weight preoccupation as a function of observed physical attractiveness: Ethnic differences among normal-weight adolescent females. *Journal of Pediatric Psychology, 31*, 803-812.

Daniels, S. R., Khoury, P. R., & Morrison, J. A. (1997). The utility of body mass index as a measure of body fatness in children and adolescents: Differences by race and gender. *Pediatrics, 99*, 804-807.

Dunn, L. M., & Dunn, L. M. (1981). *Peabody picture vocabulary test—revised.* Circle Pines, MN: American Guidance Services.

Eagly A. H., & Wood, W. (1999). The origins of sex differences in human behavior: Evolved dispositions versus social roles. *American Psychologist, 54*, 408-423.

Eastwick, P. W., & Finkel, E. J. (2008). Sex differences in mate preferences revisited: Do people know what they initially desire in a romantic partner? *Journal of Personality and Social Psychology, 94*, 245-264.

Elder, G. H. (1969). Appearance and education in marriage mobility. *American Sociological Review, 43*, 519-533.

England, P., & Farkas, G. (1986). *Households, employment, gender.* New York: Aldine Publishing Company.

Fallon, A. E., & Rozin, P. (1985). Sex differences in perceptions of desirable body shape. *Journal of Abnormal Psychology, 94*, 102-105.

Feingold, A. (1988). Matching for attractiveness in romantic partners and same-sex friends: A meta-analysis and theoretical critique. *Psychological Bulletin, 104*, 226-235.

Finkelstein, E. A., Ruhm, C. J., and Kosa, K. M. (2005). Economic causes and consequences of obesity. *Annual Review of Public Health 26*, 239-257.

Furnham, A., Moutfi, J., & Baguma, P. (2002). A cross-cultural study on the role of weight and waist-to-hip ratio on female attractiveness. *Personality and Individual Differences, 32*, 729-745.

Grilo, C. M., & Pogue-Geile, M. F. (1991). The nature of environmental influences on weight and obesity: A behavioral genetic analysis. *Psychological Bulletin, 110,* 520-537.

Hatfield, E., & Sprecher, S. (1986). Mirror, mirror: The importance of looks in everyday life. Albany: SUNY Press.

Heckman, J. (1979). Sample selection bias as a specification error. *Econometrica, 47*, 153-161.

Hill, M. E. (2002). Skin color and the perception of attractiveness among African Americans: Does gender make a difference? *Social Psychology Quarterly, 65*, 77-91.

Kalick, S. M., & Hamilton, T. E. (1986). The matching hypothesis reexamined. *Journal of Personality and Social Psychology, 51*, 673-682.

Kurzban, R., & Weeden, J. (2005). HurryDate: Mate preferences in action. *Evolution and Human Behavior, 26*, 227-244.

Maisey, D. S., Vale, E. L. E., Cornelissen, P. L., & Tovée, M. J. (1999). Characteristics of male attractiveness for women. *The Lancet, 353*, 1500.

Meland, S. A. (2002). *Objectivity in perceived attractiveness: Development of a new methodology for rating facial physical attractiveness.* Unpublished master's thesis, University of Wisconsin, Madison.

Movahed, M. R., Ahmadi-Kashani, M., Seyed, S. S. A., & Kasravi B. (2004), The prevalence of increased body mass index and obesity based on age and gender using a large database. *International Journal of Obesity, 28*, S73.

Murstein, B. I. (1972). Physical attractiveness and marital choice. *Journal of Personality and Social Psychology, 22*, 8-12.

Ogden, C. L., Carroll, M. D., Curtin, L. R., McDowell, M. A., Tabak, C. J., & Flegal, K. M. (2006). Prevalence of overweight and obesity in the United States, 1999 – 2004. *Journal of the American Medical Association, 295*, 1549-1555.

Polivy, J., Garner, D. M., & Garfinkel, P. E. (1986). Causes and consequences of the current preference for thin female physiques. In C. P. Herman, M. Zanna, & E. T. Huggins, (Eds.) *Physical appearance, stigma, and social behavior* (pp. 89-112). Hillsdale, NJ: Erlbaum.

Powell, A. D., & Kahn, A. S. (1995). Racial differences in women's desires to be thin. *International Journal of Eating Disorders, 17*, 191- 195.

Press, J. E. (2004). Cute butts and housework: A gynocentric theory of assortative mating. *Journal of Marriage and Family, 66*, 1029-1033.

Puhl, R. & Brownell, K. D. (2001). Bias, discrimination, and obesity. *Obesity Research, 9*, 788-805.

Raley, R. K., Crissey, S., & Muller, C. (2007). Of sex and romance: Late adolescent relationships and young adult union formation. *Journal of Marriage and Family, 69*, 1210- 1226.

Regan, P. C., & Anupama, J. (2003). Ideal partner preferences among adolescents. *Social Behavior and Personality, 31*, 13-20.

Regan, P. C., Levin. L., Sprecher, S., Christopher, F. S., & Cate, R. (2000). Partner preferences: What characteristics do men and women desire in their short-term sexual and long-term romantic partners? *Journal of Psychology & Human Sexuality, 12*, 1-21.

Rucker, C. E., & Cash, T. F. (1992). Body images, body-size perceptions, and eating behaviors among African-American and white college women. *International Journal of Eating Disorders, 12*, 291-299.

Shackelford, T. K., Schmitt, D. P., & Buss, D. M. (2005). Universal dimensions of human mate preferences. *Personality and Individual Differences, 39*, 447-458.

Singh, D. (1993). Is thin really beautiful and good? Relationship between waist-to-hip ratio (WHR) and female attractiveness. *Personality and Individual Differences, 16*, 123-132.

Singh, D. (1994). Body fat distribution and perception of desirable female body shape by young black men and women. *International Journal of Eating Disorders, 16*, 289- 294.

Singh, D. (1995). Female judgment of male attractiveness and desirability for relationships: Role of waist-to-hip ratio and financial status. *Journal of Personality and Social Psychology, 69*, 1089-1101.

Singh, D., & Young, R. K. (1995). Body weight, waist-to-hip ratio, breasts, and hips: Role in judgments of female attractiveness and desirability for relationships. *Ethology and Sociobiology, 16*, 483-507.

Sobal, J. (2004). Sociological analysis of the stigmatization of obesity. In J. Germov, & L. Williams (Eds.), *A sociology of food and nutrition: The social appetite* (pp. 383- 402). Melbourne, Australia: Oxford University Press.

Sobal, J. (2005). Social consequences of weight bias by partners, friends, and strangers. In K. D. Brownell, R. M. Puhl, M. B. Schwartz, & L. Rudd (Eds.), *Weight Bias: Nature, Consequences, and Remedies* (pp. 150-164). New York: The Guilford Press.

Sobal, J., & Bursztyn, M. (1998). Dating people with anorexia nervosa and bulimia nervosa: Attitudes and Beliefs of University Students. *Women and Health, 27*, 73-88.

Sobal, J., Nicolopoulos, V., & Lee, J. (1995). Attitudes about overweight and dating among secondary school students. *International Journal of Obesity, 19*, 376-381.

Stearns, P. (1997). *Fat history: Bodies and beauty in the modern west.* New York: New York University Press.

Stevens, G., Owens, D., & Schaefer, E. C. (1990). Education and attractiveness in marriage choices. *Social Psychology Quarterly, 53*, 1, 62-70.

Sweeney, M. M., & Cancian, M. (2004). The changing importance of White women's economic prospects for assortative mating. *Journal of Marriage and Family, 66*, 1015-1028.

Taylor, P. A., & Glenn, N. D. (1976). The utility of education and attractiveness for females' status attainment through marriage. *American Sociological Review, 41*, 484-498.

Thompson, S. H., Sargent, R. G., & Kemper, K. A. (1996). Black and white adolescent males' perceptions of ideal body size. *Sex Roles, 34*, 391-406.

Tovée, M. J., & Cornelissen, P. L. (2001). Female and male perceptions of female physical attractiveness in front-view and profile. *British Journal of Psychology, 92*, 391-402.

Tovée, M. J., Maisey, D. S., Emery, J. L., & Cornelissen, P. L. (1999). Visual cues to female physical attractiveness. *Proceedings of the Royal Society of London. Series B, 266*, 211-218.

Tovée, M. J., Reinhardt, S., Emery, J. L., & Cornelissen, P. L. (1998). Optimum body-mass index and maximum sexual attractiveness. *Lancet, 352*, 548.

Udry, J. R. (1977). The importance of being beautiful: A reexamination and racial comparison. *American Journal of Sociology, 83*, 1, 154-160.

Wetsman, A., & Marlowe, F. (1999). How universal are preferences for female waist-to-hip ratios? Evidence from the Hadza of Tanzania. *Evolution and Human Behavior, 20*, 219-228.

World Health Organization (WHO). (1997). *Obesity: Preventing and managing the global epidemic.* Geneva: World Health Organization.

Yates, A., Edman, J., & Aruguete, M. (2004). Ethnic differences in BMI and body/self-dissatisfaction among whites, Asian subgroups, pacific islanders, and African-Americans. *Journal of Adolescent Health, 34*, 300-307.

Yuan, Y. (2000). Multiple imputation for missing values: Concepts and new development. SUGI Paper No. P267-25, SAS Institute, Inc. Retrieved December 1, 2007, from http://support.sas.com/rnd/app/papers/multipleimputation.pdf