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Do the Health Benefits of Marriage Depend on the Likelihood of Marriage?

Marriage promotion initiatives presume substantial health benefits of marriage. Current literature, however, has provided inconsistent results on whether these benefits would be shared by people unlikely to marry. We investigate whether the physical and mental health benefits of marriage depend on the likelihood of marriage. Whereas prior studies have compared health benefits of marriage across a single predictor of marriage chances, we define the likelihood of marriage as a composite of demographic, economic, and health characteristics. Using the National Longitudinal Survey of Youth 1979, we find that married adults are only modestly healthier than unmarried adults in both physical and mental dimensions. People with a higher likelihood of marriage generally do not reap greater health benefits from marriage than their counterparts. The only exception is that continuous marriage is more strongly associated with improved mental health among men who are more likely to be married.

Fewer Americans than ever are getting married, and in some groups, cohabitation has emerged as an alternative to marriage, and the proportion of children raised by single or cohabiting rather than married parents has increased (Cherlin, 2009; Manning & Smock, 2005). Responding to this retreat from marriage, some scholars have made a case for marriage promotion (Nock, 2005; Waite, 1995), prominently citing the health benefits of getting and staying married (Waite & Gallagher, 2000). Marriage promotion initiatives target people who are less likely to marry to extend the health benefits of marriage to this group (Manning, Trella, Lyons, & Du Toit, 2010; Ooms & Wilson 2004; Umberson & Montez, 2010). Yet it is unclear if marriage would benefit people who are least likely to marry (Huston & Melz, 2004). This study examines whether the health benefits of marriage are weakest for people who are least likely to marry, taking into account marital selection processes. We examine how a holistic measure of the likelihood of marriage may moderate the health benefits of marriage (i.e., make marriage more or less beneficial for people who are more or less likely to marry).

Interest in marriage has been spurred by the American "retreat from marriage," evinced by falling marriage rates during the postwar period (Cherlin, 2009). This retreat from marriage has been uneven across groups defined by race, socioeconomic status (SES), or health status (Gibson-Davis, Edin, & McLanahan, 2005; Tucker & Taylor, 1989; Tumin 2016). To understand why marriage rates have declined faster in certain groups, scholars have compared the predictors of marriage between groups with

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low marriage rates and the population at large (Oppenheimer, 2003; Tucker & Taylor, 1989). This research shows that many factors contribute to the chances of marriage and that different factors related to the likelihood of marriage interact with one another to influence opportunities and decisions to marry (Edin & Reed 2005; Lichter et al. 2003; Ooms & Wilson 2004). Consequently, the likelihood of people getting and staying married cannot be reduced to any single observed characteristic.

The multidimensionality of the likelihood of marriage complicates the analysis of how marriage influences health. Efforts to promote marriage to those unlikely to marry assume that this population would reap the same benefits from marriage as people who are highly likely to marry (Huston & Melz, 2004). However, this assumption does not recognize that the benefits of marriage could be weaker for people who are unlikely to get married and stay married. For example, one study estimated that the economic benefits of staying married would not be enough to close the financial gap between women who actually stay married and those who divorce (Smock, Manning, & Gupta, 1999). In the case of health status, prior studies have described how the linkage between marriage and health varies across individual characteristics, such as race (Teachman, 2010) or SES (Choi & Marks, 2011, 2013). Some of these characteristics, such as premarital fertility, discourage marriage and reduce its health benefits (Williams, Sassler, & Nicholson, 2008). Other factors, such as low income, discourage marriage but increase its health benefits (Choi & Marks, 2011).

One reason for these mixed findings is that comparing the associations between marriage and health status across only one component of the likelihood of marriage may lead to describing differences in the benefits of marriage that are largely due to other characteristics. For example, greater benefits of marriage among Whites when compared with Blacks may be due to greater differences in other characteristics between married and unmarried Whites when compared with these differences between married and unmarried Blacks. Without controlling for the moderating effects of these other characteristics, Whites may seemingly benefit more from marriage than Blacks. In other words, the factors influencing selection into marriage may lead to the observation that some groups seemingly reap greater health benefits from marriage. Therefore, without accounting for a broad range of premarriage selection factors, we may incorrectly estimate the overall marriage effect on health and any heterogeneity in this marriage effect. Importantly, we refer here to a hypothesized effect of marriage but do not suggest that estimates from the present study represent effect sizes that are entirely free of confounding.

As the likelihood of marriage is determined by many factors, it would be infeasible to simultaneously test for differences in the health benefits of marriage across all predictors of marriage. This problem of attempting to simultaneously account for many plausible covariates has been described as the curse of dimensionality (Rosenbaum & Rubin, 1983). Drawing on this literature, we estimate the likelihood of marriage as a composite of social, economic, health, and demographic factors that predict marriage. This approach allows us to account for selection into marriage and test for heterogeneity in the association between marriage and health outcomes across a holistic measure of the likelihood of marriage. Substantively, this approach answers a broad question in the debate over marriage promotion: whether adults who are unlikely to marry receive comparable health benefits from marriage as adults who are very likely to marry. In the following sections, we discuss influences on the likelihood of marriage and how this likelihood potentially moderates the association between marriage and health status.

Factors Influencing the Likelihood of Marriage

In the United States, high likelihood of marriage has become associated with high SES, signified by high income and high levels of educational attainment (Goldstein & Kenney, 2001). Furthermore, Whites have become more likely to marry, relative to Blacks or Hispanics (Teachman, Tedrow, & Crowder, 2000). High expectations of marriage, high relationship quality, and the absence of children from previous relationships also increase the likelihood of marrying (Qian, Lichter, & Mellott, 2005; Waller & McLanahan, 2005). Last, health status and health behaviors have also been identified as predictors of marriage, with lower chances of marriage and a more restricted pool of partners available to people experiencing health problems or disability (Carmalt, Cawley, Joyner, & Sobal, 2008; Janus, 2009; Tumin, 2016). This

list of factors predicting marriage, although not exhaustive, illustrates the diversity of traits implicated in this construct.

Because multiple factors shape the chances of marriage, no single observed characteristic suffices as a measure of the likelihood of marriage. For example, the influences of SES on the likelihood of marriage can vary by race, with Blacks placing greater emphasis on a potential spouse's economic stability than Whites (Bulcroft & Bulcroft, 1993). Similarly, high levels of educational attainment are stronger predictors of marriage for Black men than for White men (Oppenheimer, 2003). Other studies show that the importance of specific marriage predictors can vary between women living in metropolitan and nonmetropolitan areas (McLaughlin, Lichter, & Johnston, 1993) and between adults with disabilities and adults without disabilities (Tumin, 2016; Wells, Sandefur, & Hogan, 2003). These findings underscore that the likelihood of marriage cannot be satisfactorily approximated by a single observed characteristic.

The discussion of groups unlikely to marry has often focused specifically on the role of poverty in reducing the likelihood of marriage (Edin & Reed, 2005; Lichter, Graefe, & Brown, 2003; Ooms & Wilson, 2004). However, the low chances of marriage in groups targeted by marriage promotion are due to a constellation of factors (including those reviewed previously) rather than the exclusive consequence of any single factor. Treating likelihood of marriage as a composite of multiple predictors allows us to account for selection into marriage as well as test for heterogeneity in the health benefits of marriage, as elaborated next.

Heterogeneity in the Health Benefits of Marriage

Marriage can improve health through multiple pathways, including social support, social control of health behaviors, and access to resources that can be used to protect health (Umberson & Montez, 2010; Williams & Umberson, 2004). Yet the benefits of marriage can vary between people who are highly likely to marry and people who are relatively unlikely to marry. We refer to this variation as heterogeneity in the health benefits of marriage. Two theories from the literature on returns to higher education inform our competing hypotheses about heterogeneity in the link between marriage and health. According to resource substitution theory (Ross & Mirowsky, 2010), the health benefits of marriage are greatest for people who are less likely to marry because marriage substitutes for socioeconomic disadvantages (e.g., poverty) that act as barriers to this life course transition. According to resource multiplication theory (Ross & Mirowsky, 2006), the health benefits of marriage could be greatest for people who are most likely to marry because the health advantages of marriage might act in synergy with characteristics that make people more likely to get married (e.g., higher educational attainment).

Several studies report findings relevant to the two hypotheses. One study supporting resource substitution theory found that marriage was associated with greater longevity more strongly among low-income men when compared with high-income men (Choi & Marks, 2011), even though the former are less likely to get married (Sweeney, 2002). Other studies have provided indirect support for resource substitution theory by showing that continuous marriage improves health behaviors and mental health even in groups where marriage rates have declined the most (Ali & Ajilore, 2011; Green, Doherty, Fothergill, & Ensminger, 2012; Hill, Reid, & Reczek, 2013). However, several studies report findings consistent with resource multiplication theory, suggesting that characteristics that make people unlikely to marry could attenuate the benefits of marriage. As an example, among Black women, who are less likely to marry than White women, marriage increases the risk of health limitations, whereas among men, marriage reduces the risk of health limitations more strongly for Whites when compared with Blacks (Teachman, 2010). Similarly, the beneficial influence of marriage on lower substance use is weaker among Black young adults than White or Hispanic young adults (Harris, Lee, & DeLeone, 2010), and the adverse association between marriage and weight gain is strongest for adults with lower educational attainment, who are relatively less likely to marry (Kroeger, 2017).

These studies have provided rich but inconsistent evidence about heterogeneity in the association between marriage and health status across single predictors of marriage (e.g., differences in the association between marriage and health solely according to race or ethnicity). Yet this apparent heterogeneity may result from the moderating influences of other factors, as outlined previously. For example, education

may moderate the association between marriage and health through its association with income (Choi & Marks, 2011), and this mechanism may be missed if education were the only factor considered as a potential moderator. If the gap in income between married and unmarried were larger among more highly educated adults, seemingly greater health returns from marriage to highly educated adults might be attributable to a larger income gap in this subpopulation. To obtain an unbiased estimate of the association between marriage and health outcomes, we need to mitigate both the bias due to selection into marriage as well as bias due to differences in the hypothesized marriage effect.

Current Study

To overcome the problems of premarriage selection bias, we apply the concept of the likelihood of marriage to the methodological problem of studying heterogeneity in the association between marriage and health outcomes. Although it is infeasible to simultaneously test for heterogeneity in the association between marriage and health across all variables that influence the chances of marriage, we can test for heterogeneity in the health benefit of marriage across a composite score of factors that shape the likelihood of marriage. Specifically, we examine how associations between marriage and health status vary across levels of the marriage propensity score using a heterogeneous treatment effect model (Xie, Brand, & Jann, 2012). Under the ignorability assumption, where no omitted variables simultaneously affect both selection into marriage and the outcome variable, the only interaction consequential for selection bias is between marriage and the propensity of marriage (Xie, Brand, & Jann, 2012). Substantively, using this method, we investigate whether people who are least likely to marry benefit as much as those who are most likely to marry so that we can address the long-standing debate on whether promoting marriage can serve to promote health (Huston & Melz, 2004).

Method

Data

We used data from the National Longitudinal Study of Youth, 1979 cohort (NLSY79; Bureau of Labor Statistics, 2010), which had initially enrolled a cohort of 12,686 Americans aged 14 to 22 years in 1979. Respondents were interviewed annually until 1994 and biennially since then. We obtained baseline measures from annual interviews spanning the years 1979 to 1985 and outcome measures from interviews conducted in 1998, 2000, 2002, 2004, and 2006. In 1998–2006, each respondent completed the 40+ health module in their first interview after reaching age 40. Among respondents contributing data in this module, we modeled the likelihood of marriage as a function of characteristics measured by age 20 (Table 1). Independent variables in this model included demographic and socioeconomic characteristics associated with being married at age 40 (birth date, race or ethnicity, mother's education, own education, family poverty status; Sweeney, 2002). We also controlled for family structure during childhood (number of siblings, residence with both parents; Musick & Mare, 2006), cultural factors that may have influenced desire to marry (religious background, marriage expectations; Guzzo, 2009; Xu, Huspeth, & Bartkowski, 2005), baseline health status (health-related limitations on respondents' employment; Tumin, 2016), and premarital union history (cohabitation, childbearing; Musick, 2007).

Of the original 12,686 respondents, we excluded 2,923 respondents in the military and economically disadvantaged non-Hispanic White oversamples. These oversamples were mostly discontinued after 1986, and therefore respondents in these groups would have been ineligible to complete the 40+ health module. Next, we excluded 1,297 respondents older than 20 years of age at the 1979 interview and 1,420 respondents who had already married by 1979 or by their 20th birthday to limit our sample to respondents with premarriage data on characteristics influencing the likelihood of marriage. Of the remaining 7,046 respondents, we excluded 967 respondents lost to follow-up before the 40+ health module was administered and 275 respondents missing data on outcome measures of depressive symptoms ($n = 270$) and self-rated health ($n = 5$). Finally, we excluded 1,190 cases missing data on study covariates, yielding an analytic sample of 2,471 men and 2,143 women. As our analysis involved multiple rounds of the NLSY79, we applied custom frequency weights provided by the Bureau of Labor Statistics (Bureau of Labor Statistics, no date) to the descriptive statistics and regression

Table 1. *Variables Used to Construct Propensity Score Models*

Name	Description	Type
Birth month	Century-month code; 1 = January 1960	Continuous
Mother's education	Less than 12 years, 12 years, more than 12 years	Categorical
Intact family at 14	Lived with both biological parents at age 14	Binary
Siblings	Number of living siblings	Continuous
Educational attainment	Less than 12 years, 12 years, more than 12 years	Categorical
Poverty status	Family income was below poverty line	Binary
Health limitation	Health limited amount or type of work	Binary
Cohabitation	Respondent reported cohabitation	Binary
Any children	Respondent lived with any of his or her children	Binary
Religious upbringing	Catholic, Baptist, other Protestant, or other	Categorical
Expected age at marriage	Respondent expects to marry by age 24	Binary
Expect marriage in 5 years	Respondent expects to be married in 5 years	Binary
Race or ethnicity[a]	Non-Hispanic White, non-Hispanic Black, or Hispanic	Categorical

[a]Includes interactions with all other variables in the model.

analyses to adjust for unequal probabilities of sample selection and attrition. All analyses were performed using Stata MP 13.1 (StataCorp, College Station, TX, USA).

Health Outcomes

We used two measures from the 40+ health module to describe respondents' physical and mental health at midlife. The first measure was the respondent's rating of his or her general health on a 5-point scale from *excellent* (5) to *poor* (1). Self-rated health is highly correlated with morbidity and mortality risk (Idler & Benyamini, 1997; Idler, Russell, & Davis, 2000) and is commonly used in studies assessing the health implications of marriage (Hughes & Waite, 2009; Williams, Sassler, Frech, Addo, & Cooksey, 2011; Williams & Umberson, 2004). We treated self-rated health as a continuous variable, with higher values indicating better health (Zheng, Yang, & Land, 2011). Our second measure was a truncated version of the Center for Epidemiological Studies Depression (CES-D) scale. The full CES-D scale contained 20 items from previously validated scales and agreed well with clinical evaluations of depression (Radloff, 1977).

In the 40+ health module, respondents were asked how often they experienced each of the following seven symptoms of depression during the past week: "I did not feel like eating; my appetite was poor;" "I had trouble keeping my mind on what I was doing;" "I felt depressed;" "I felt that everything I did was an effort;" "my sleep was restless;" "I felt sad;" and "I could not get 'going.'" Responses were coded as: 0 = "rarely or none of the time," 1 = "some or a little of the time," 2 = "occasionally or a moderate amount of the time," and 3 = "most or all of the time." Responses were summed to yield a score ranging from 0 to 21 points, except for cases missing data on one or more of the items in the CES-D scale. We treated the CES-D outcome as a continuous variable, with higher values on this scale indicating worse mental health (Mossakowski, 2015; Whitworth, 2017).

Marital History

We considered being married at age 40 as a binary "treatment," which may be associated with better health at midlife (Williams et al., 2011). As prior studies found continuous marriage is most consistently associated with health benefits, we also examined a second categorization of marital status, comparing respondents who have been continuously married until age 40 to a reference group including the never married, divorced, separated or widowed, and remarried. In a sensitivity analysis, we excluded the never married from the latter comparison, to contrast continuous with disrupted marriage. We used the NLSY79 constructed marital history variables (dates of entry and exit for each marriage; previously described by Haurin, 1994) to calculate our measures of marriage. As less than 5% of respondents ever exited a third marriage, we considered any respondent who entered a third marriage to be married from that point onward. Current marriage was coded 1 if the respondent

married or remarried before age 40 and if that marriage did not end or ended after the respondent turned 40, and 0 otherwise. Continuous marriage was coded 1 if the respondent has ever married by age 40 and the end date of their first marriage was either later than their 40th birthday or missing, and 0 otherwise.

Propensity Score of Marriage

For each measure of marriage, we estimated its association with the two health outcomes using propensity score methods (Rosenbaum & Rubin, 1983). Briefly, propensity score methods seek to draw causal inference from observational data under the assumption of ignorability. If X is a vector of covariates determining assignment to the treated ($D = 1$) or control ($D = 0$) group, the propensity score is the probability of being in the treated group conditional on the variables in X. The ignorability assumption states that the propensity score absorbs all of the confounding effects and, therefore, that exposure to the treatment will be independent of the outcome of interest Y, conditional on the propensity score.

$$\left(Y^1, Y^0\right) \perp D \mid P(D = 1|X) \qquad (1)$$

where $\perp$ denotes independence, and $P(D = 1|X)$ is the propensity score.

The propensity model is a logistic regression model where the likelihood of receiving the treatment (here, the likelihood of marriage) is the dependent variable, and independent variables include factors that may plausibly influence this likelihood as well as the study outcome (here, health status; Caliendo & Kopeinig, 2008; Rubin & Thomas, 1996). We included a range of plausible determinants of the likelihood of marriage in the propensity model (Table 1), measured by age 20, before the respondents in the analytic sample have entered their first marriage. We included interactions between all covariates and race or ethnicity to improve covariate balance between treated and control groups. Based on the regression estimates of the propensity model (individual predicted log odds of marriage), we divided married and unmarried respondents into propensity strata (Becker & Ichino, 2002), representing strata of the likelihood of marriage. The stratification algorithm began with quintiles of the propensity score, and t tests were used to compare covariate means between married and unmarried people within each stratum. When a statistically significant imbalance was detected, strata were bisected, and the test for balance was repeated. To ensure sufficient subsample sizes in each stratum, very small strata (<10 cases) of least or greatest likelihood of marriage were combined with the next-highest or next-lowest stratum, respectively. Covariate balance between married and unmarried respondents within each stratum was summarized using standardized differences, with values <0.1 considered to represent good balance (Austin, 2011). Cases outside the range of propensity scores where married and unmarried respondents overlapped were excluded from the determination of propensity score strata and from further estimation of stratum-specific treatment effects. The estimated average treatment effect (i.e., the overall association between marriage and health status) was calculated as the weighted average of stratum-specific treatment effects (i.e., stratification matching), as previously described (Caliendo & Kopeinig, 2008).

Heterogeneous Treatment Effects

Our primary interest in applying propensity score methods was to examine heterogeneity in the association between marriage and health status among people with different likelihoods of marriage (Brand & Xie, 2010; Xie et al., 2012). Stratum-specific associations between marriage and health status were estimated in the following hierarchical linear model:

$$Y_{ij} = \alpha_j + \delta_j D_{ij} + \varepsilon_{ij} \qquad (2)$$

$$\delta_j = \delta_0 + \phi_j + \eta_j$$

where i indexed the case, j indexed the propensity score stratum, ϕ was the linear slope of the treatment effect across propensity score strata, and the level 2 error, η_j, was assumed to be normal. The linear slope of the treatment effect (ϕ) was the main parameter of interest. For example, if the association between marriage (D) and a summary measure of good health (Y) were generally positive, a positive slope, $\phi > 0$, could suggest that people who are more likely to marry benefit more from marriage, and people who are less likely to marry benefit less from marriage. If the relationship between treatment D and outcome Y were generally

Table 2. *Weighted Means or Proportions of Premarriage Characteristics, by Gender and Marital Status*

	Women, $n = 2{,}143$				Men, $n = 2{,}471$			
	Married at age 40		Unmarried at age 40		Married at age 40		Unmarried at age 40	
Variable	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*
Birth month[a]	744	1	745	1	744	1	744	1
At 1979 interview								
Race or ethnicity								
Non-Hispanic White	0.84	0.01	0.64	0.02	0.84	0.01	0.70	0.01
Non-Hispanic Black	0.11	0.01	0.30	0.02	0.11	0.01	0.23	0.01
Hispanic	0.05	0.004	0.06	0.01	0.05	0.004	0.07	0.01
Mother's education								
Less than 12 years	0.26	0.01	0.33	0.02	0.24	0.01	0.34	0.02
12 years	0.47	0.02	0.43	0.02	0.51	0.01	0.46	0.02
More than 12 years	0.27	0.01	0.24	0.02	0.25	0.01	0.20	0.02
Religious upbringing								
Catholic	0.20	0.01	0.29	0.02	0.20	0.01	0.25	0.02
Baptist	0.27	0.02	0.26	0.02	0.31	0.01	0.28	0.02
Other Protestant	0.38	0.02	0.29	0.02	0.34	0.01	0.32	0.02
All others	0.15	0.01	0.16	0.02	0.15	0.01	0.15	0.01
Expect to marry by age 24	0.68	0.01	0.56	0.02	0.50	0.02	0.42	0.02
Expect to marry in 5 years	0.47	0.02	0.40	0.02	0.33	0.01	0.29	0.02
Intact family at 14	0.81	0.01	0.67	0.02	0.80	0.01	0.71	0.02
Number of siblings	3.10	0.10	3.40	0.10	3.00	0.10	3.30	0.10
By age 20								
Own education								
Less than 12 years	0.08	0.01	0.16	0.01	0.13	0.01	0.26	0.02
12 years	0.46	0.02	0.51	0.02	0.54	0.01	0.49	0.02
More than 12 years	0.47	0.02	0.33	0.02	0.33	0.01	0.25	0.02
Any children	0.05	0.01	0.13	0.01	0.01	0.002	0.01	0.004
Poverty status	0.24	0.01	0.39	0.02	0.23	0.01	0.36	0.02
Health limitation	0.07	0.01	0.09	0.01	0.07	0.01	0.11	0.01
Cohabitation	0.04	0.01	0.07	0.01	0.01	0.002	0.01	0.004

[a]Century-month code, 1 = January 1960.

negative, we would draw the same conclusion when $\phi < 0$.

To account for residual confounding by any covariates that may have remained imbalanced within strata (despite the balancing tests described previously), we controlled for all variables used to construct the propensity score as covariates within each stratum, as recommended by Rubin and Thomas (1996). This approach improved balance in the premarriage factors between the married and unmarried respondents within each stratum to lend greater support to the interpretation that estimated differences in health outcomes between married and unmarried people in each stratum originate from the difference in marital status.

Results

Table 2 summarizes the characteristics of men and women in the sample according to whether they were currently married at age 40. At age 40, 67% of men and 69% of women were married, and 52% of men and 55% of women were still in their first marriage (i.e., continuously married). After restricting the sample to men and women in the region of common support (i.e., where there were both married and unmarried respondents with each level of the likelihood of marriage), we divided the sample into strata of the propensity score. Covariate imbalances were mostly but not entirely eliminated when assessed within each stratum (Appendix A). Gender-specific average

Table 3. *Stratification Matching Estimates of Current and Continuous Marriage Average Treatment Effects, by Gender*

Treatment	n[a]	Average treatment effect on CES-D scale		Average treatment effect on self-rated health	
		b	*SE*	*b*	*SE*
Women					
Current marriage	2,141	−0.80***	0.21	0.16**	0.05
Continuous marriage	2,140	−0.82***	0.19	0.11*	0.05
Continuous marriage among ever married	1,637	−0.99***	0.24	0.12*	0.06
Men					
Current marriage	2,467	−0.67***	0.17	0.12**	0.04
Continuous marriage	2,471	−0.69***	0.15	0.12**	0.04
Continuous marriage among ever married	1,822	−0.74***	0.20	0.11*	0.05

Note. CES-D = Center for Epidemiological Studies Depression.

[a]Cases in common support region used to calculate average treatment effect.

*$p < .05$; **$p < .01$; ***$p < .001$, two-tailed tests.

treatment effects, obtained using stratification matching, representing associations between current and continuous marriage and the two health outcomes in the overall sample, are summarized in Table 3. On average, marriage was associated with better self-rated health, but the magnitude of this difference was less than 0.2 points on a scale with 1 to 5 points. Similarly, marriage was associated with an average improvement of <1 point on a 23-point scale of depressive symptoms.

We applied a hierarchical linear model to estimate stratum-specific associations between current marriage and health status and the linear trend in these associations across propensity strata, as summarized in Table 4. Among women, current marriage was associated with improved mental health in the middle stratum (of seven), estimated as a 1.91-point reduction on the CES-D scale of depressive symptoms. Current marriage was also associated with statistically significant but modest improvements in

Table 4. *Estimated Propensity Score Stratum-Specific Treatment Effects of Current Marriage and Linear Relationship Between Propensity Stratum and Estimated Treatment Effect*

Stratum	Score range	Treatment effect on CES-D scale		Treatment effect on self-rated health	
		b	*SE*	*b*	*SE*
Women, $n = 2{,}141$					
1, $n = 233$	0.0, 0.4	−1.12	1.02	0.25	0.15
2, $n = 303$	0.4, 0.5	−0.13	0.77	−0.12	0.13
3, $n = 317$	0.5, 0.6	−1.09	0.57	0.29*	0.14
4, $n = 378$	0.6, 0.7	−1.91**	0.69	0.30*	0.15
5, $n = 257$	0.7, 0.75	−1.26	0.70	0.21	0.15
6, $n = 267$	0.75, 0.8	−0.28	0.64	0.10	0.18
7, $n = 386$	0.8, 1.0	0.04	0.43	0.11	0.12
Slope across strata		0.19	0.12	0.00	0.03
Men, $n = 2{,}467$					
1, $n = 227$	0.0, 0.4	−0.36	0.78	0.12	0.18
2, $n = 102$	0.4, 0.5	−0.29	0.66	−0.15	0.15
3, $n = 195$	0.5, 0.6	−0.18	0.45	0.05	0.11
4, $n = 523$	0.6, 0.7	−0.42	0.42	0.09	0.10
5, $n = 567$	0.7, 0.8	−1.00**	0.32	0.25**	0.08
6, $n = 853$	0.8, 1.0	−0.09	0.50	0.03	0.22
Slope across strata		−0.09	0.14	0.06	0.04

Note. CES-D = Center for Epidemiological Studies Depression.

*$p < .05$; **$p < .01$, two-tailed tests.

Table 5. *Estimated Propensity Score Stratum-Specific Treatment Effects of Continuous Marriage and Linear Relationship Between Propensity Stratum and Estimated Treatment Effect*

		Treatment effect on CES-D scale		Treatment effect on self-rated health	
Stratum	Score range	*b*	*SE*	*b*	*SE*
Women, $n = 2{,}140$					
1, $n = 70$	0.0, 0.2	-3.25^{*}	1.48	0.18	0.37
2, $n = 463$	0.2, 0.4	−0.86	0.63	0.23	0.12
3, $n = 465$	0.4, 0.5	-1.72^{**}	0.53	0.17	0.13
4, $n = 519$	0.5, 0.6	-1.23^{**}	0.39	0.22^{*}	0.11
5, $n = 401$	0.6, 0.7	0.03	0.42	−0.04	0.10
6, $n = 222$	0.7, 1.0	−0.19	0.48	−0.01	0.14
Slope across strata		0.43^{**}	0.16	−0.07	0.04
Men, $n = 2{,}471$					
1, $n = 29$	0.0, 0.2	2.79	2.56	−0.74	0.50
2, $n = 750$	0.2, 0.4	−0.21	0.48	−0.07	0.10
3, $n = 521$	0.4, 0.5	−0.15	0.40	0.18	0.10
4, $n = 592$	0.5, 0.6	-0.80^{**}	0.30	0.07	0.08
5, $n = 579$	0.6, 1.0	-1.13^{***}	0.30	0.24^{**}	0.08
Slope across strata		-0.40^{*}	0.17	0.09^{*}	0.04

Note. CES-D, Center for Epidemiological Studies Depression.
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$, two-tailed tests.

self-rated health among women in the third and fourth strata (gains of 0.29 and 0.30 points on a 5-point scale, respectively). Among men, those in the fifth (of six) propensity strata evinced a statistically significant association between current marriage and fewer depressive symptoms (1-point reduction on a 23-point scale) as well as higher self-rated health (0.25 point improvement on a 5-point scale). However, our analysis of current marriage at age 40 demonstrated that all linear slopes of the association between marriage and health status across propensity strata (ϕ) were not statistically significant, indicating no trend of greater or lesser marriage benefit to health among men or women more likely to be married.

Next, we evaluated whether our conclusions were sensitive to the definition of marriage used. With continuous marriage considered to impart greater health benefits, we assessed stratum-specific associations between continuous marriage (vs. disrupted marriage or having never married) and health among men and women in Table 5. Among men, there was stronger support for heterogeneity in the health benefit of marriage, where men who were most likely to be continuously married also had the greatest advantage in mental and physical health over men in the reference group. This was shown by statistically significant trends (ϕ) of the association between marriage and health status across propensity strata. Specifically, $\phi = -0.40$ for the outcome of depressive symptoms indicated stronger association between continuous marriage and reduced depressive symptoms among men who were more likely to be continuously married. Likewise, $\phi = 0.09$ for the outcome of self-rated health indicated stronger association between continuous marriage and better self-rated health among men who were more likely to be continuously married. Despite this evidence for a trend in the association between continuous marriage and health status across strata of marriage chances, we noted that even among men most likely to be continuously married, the estimated associations between continuous marriage and health status were qualitatively small and similar to the average treatment effects estimated for the overall cohort in Table 3: a 1.13-point reduction on a 23-point scale of depressive symptoms and a 0.24-point improvement on a 5-point scale of self-rated health.

Among women, continuous marriage was most strongly associated with improved mental health for women in the lowest propensity stratum (those least likely to be continuously married), contributing to an inverse relationship

Table 6. *Estimated Propensity Score Stratum-Specific Treatment Effects of Continuous Marriage Among Ever-Married Respondents and Linear Relationship Between Propensity Stratum and Estimated Treatment Effect*

		Treatment effect on CES-D scale		Treatment effect on self-rated health	
Stratum	Score range	*b*	*SE*	*b*	*SE*
Women, $n = 1{,}637$					
1, $n = 68$	0.0, 0.4	−2.53	1.52	0.33	0.22
2, $n = 124$	0.4, 0.5	−0.99	1.30	0.02	0.28
3, $n = 115$	0.5, 0.55	−1.78	1.03	0.15	0.24
4, $n = 184$	0.55, 0.575	−0.75	1.06	−0.04	0.26
5, $n = 239$	0.575, 0.6	−1.62	1.11	0.14	0.30
6, $n = 262$	0.6, 0.65	-1.85^{**}	0.64	0.22	0.16
7, $n = 214$	0.65, 0.7	−1.16	0.64	0.32^{*}	0.16
8, $n = 233$	0.7, 0.8	−0.28	0.38	−0.11	0.11
9, $n = 198$	0.8, 1.0	−0.52	0.80	0.16	0.17
Slope across strata		0.23	0.12	−0.03	0.03
Men, $n = 1{,}822$					
1, $n = 60$	0.0, 0.4	0.20	1.34	−0.24	0.27
2, $n = 127$	0.4, 0.5	−0.93	1.24	0.00	0.21
3, $n = 347$	0.5, 0.6	0.28	0.49	0.07	0.13
4, $n = 1{,}150$	0.6, 0.8	-1.08^{***}	0.26	0.17^{**}	0.06
5, $n = 138$	0.8, 1.0	−2.38	1.25	0.24	0.34
Slope across strata		-0.68^{*}	0.31	0.11	0.07

Note. CES-D, Center for Epidemiological Studies Depression.
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$, two-tailed tests.

between the likelihood of continuous marriage and its association with improved mental health ($\phi = 0.43$, indicating smaller reduction of depressive symptoms with continuous marriage in higher strata of the likelihood of marriage). Yet this finding could not be replicated when never-married women were excluded from the comparison group (Table 6; ϕ closer to 0 and no longer statistically significant). Nor could we replicate, in analysis shown in Table 6, the association between the likelihood of continuous marriage and its association with improved self-rated health among men. Indeed, when comparing continuous marriage to disrupted marriage—arguably the comparison that should have generated the greatest contrast in health outcomes (Table 3)—only men's mental health showed results consistent with a greater marriage benefit in higher propensity strata.

Discussion

Marriage promotion programs endure in the United States more than 2 decades since the passage of welfare reform legislation that first endorsed marriage as a path out of poverty (Lee, 2015; Randles & Woodward, 2018). These programs presume that the benefits of marriage could apply even to people who are unlikely to marry (Huston & Melz, 2004; Lee, 2015). Prior studies on the health benefits of marriage have revealed conflicting results about whether the health benefits of marriage are greater for people who are less likely to marry or for people who are more likely to marry. We have characterized these competing hypotheses as drawing on resource substitution theory and resource multiplication theory, respectively. To resolve which pattern better characterizes the heterogeneity of marriage benefits to health, we tested whether the health benefits of marriage are greater or lesser for people with a higher composite score representing the likelihood of marriage. In contrast to prior studies that have examined how health benefits of marriage varied across a single characteristic influencing marriage chances, our measurement of the likelihood of marriage reflects a comprehensive combination of demographic, economic, and health characteristics.

Our first major finding is the lack of heterogeneity in the association between current marriage at age 40 and self-reported physical or mental health outcomes at that age. This lack of heterogeneity means that neither the resource

substitution nor the resource multiplication perspectives were supported by the findings, as these competing hypotheses both assumed some consistent pattern of change in the health benefits of marriage according to the likelihood of marriage. Prior studies have used the NLSY79 to characterize how marriage at this age is associated with health outcomes, noting that the benefits of marriage were generally small (Carlson, 2012; Garbarski, 2015; Williams et al., 2011). Our study adds evidence that health differences according to marital status at age 40 (married vs. unmarried) remain modest even when examining men and women who were most likely to marry. For example, stratum-specific differences in self-rated health scores according to current marriage at age 40 ranged from −0.15 to 0.30 in our study, whereas average treatment effects were 0.12 for men and 0.16 for women (higher values signifying better health). In contrast, prior studies have described group differences in self-rated health of 0.39 points according to race and 0.47 points according to educational attainment (Allen, McNeely, & Orme, 2016; Burgard, Brand, & House, 2007). Although a few stratum-specific estimates of the marriage benefit approach the magnitude of these established differences in health, there was no consistent pattern across strata of the likelihood of marriage that was congruent with either resource substitution or resource multiplication theories.

Second, we found that focusing on continuous marriage showed slightly greater, but still modest, associations between marriage and improved health. Although continuous marriage may be associated with better health than marriage disrupted by separation or divorce, some previous studies using other data sets have suggested that long-standing marriages did not predict improved health relative to remaining single (Musick & Bumpass, 2012; Tumin, 2017). Our analysis of continuous marriage also revealed some evidence consistent with resource multiplication theory among men, such that continuous marriage was most strongly associated with improved health among men who were more likely to be continuously married. At first glance, this finding is similar to prior research describing weaker benefits of marriage for people who are unlikely to marry because their marriages may be relatively unstable or may not sufficiently counteract stressors associated with poverty and racial discrimination. Yet, considering heterogeneity in the association between marriage and health status more broadly, we found that this pattern was not replicated for women and was only partially supported when limiting the analysis to a contrast of men in continuous as opposed to disrupted marriages. These sensitivity analyses reflect prior approaches to the issue of marital duration, which aim to account for the possibility that only lasting marriage is associated with improved health (Dupre & Meadows, 2007; Tumin, 2017). In this broader perspective, our analyses reveal no pattern of heterogeneity in the association between marriage and health status that is consistent across the various definitions of marriage and comparison groups.

This result, obtained using propensity score methods, offers weaker support for heterogeneity in the health benefits of marriage than past studies examining how the marriage benefit varies according to single moderating variables. In studies examining a single moderating factor, the definition of the "least likely to marry" group does not take into account heterogeneity in the association between marriage and health status across other dimensions. Yet people delay or defer marriage for a variety of reasons that do not necessarily coincide with one another. In our study, we referred to the "likelihood of marriage" to describe a composite of various reasons why people could not or did not get and stay married by midlife. Prior studies have attributed causes of low likelihood of marriage to overarching constructs such as "disadvantage" (Edin & Reed, 2005; Lichter, 2001), but our results suggest that reasons not to marry may not be as cohesive as this label implies. Therefore, an important direction for future research is to better characterize clusters of attributes that define low marriage chances and determine to what extent they are consistent with concepts of social disadvantage.

Another important direction for further work is the extension of this analysis to cohorts younger than the Baby Boomers surveyed by the NLSY79. Although studies using NLSY79 have been central to the literature exploring the health consequences of marriage (Averett, Sikora, & Argys, 2008; Duncan, Wilkerson, & England, 2006; Frech & Williams, 2007; Williams et al., 2011), members of this cohort will soon reach their 60s, and their experiences may be different from cohorts growing up after the steep 1970s decline in marriage rates.

Two recent studies suggest that in both Europe and the United States, associations between marriage and physical health have eroded in younger cohorts, possibly due to decreasing lifestyle differences between married and single adults (Kalmijn, 2017; Tumin, 2017). It remains to be seen how weakening associations between marriage and health might affect heterogeneity in this association and whether the pattern seen for heterosexual marriages can be generalized to other union types (Frech, Lynch, & Barr, 2016). Plausibly, with the advantages of marriage eroding as singlehood becomes more normative, even the groups tending to benefit most from marriage might see these benefits decline.

Our conclusions are limited by some aspects of the data and analytic approach. Most important, the NLSY79 collected detailed measures of health at only a few time points (e.g., age 40), limiting our ability to adjust for selection bias using event-history techniques. Instead, we used propensity score methods to incorporate the available rich data on early-adulthood characteristics that influence marriage chances (Williams et al., 2011; Williams, Sassler, Addo, & Frech, 2015). Propensity score methods may never completely satisfy the ignorability assumption (Xie et al., 2012) but are appropriate when repeated-measures data on the outcome of interest are unavailable. When compared with a recent analysis of self-rated health in the Panel Study of Income Dynamics (Tumin, 2017), our estimates of the overall association between marriage and self-rated health are very close to results from random-effects models, but greater than estimates from fixed effects models. The statistical inefficiency of fixed effects regression would have been magnified in our study by the inefficiency of estimating stratum-specific associations between marriage and health status (Caliendo & Kopeinig, 2008). Beyond age 40, further accumulation of time in marriage might have strengthened the association seen between continuous marriage and improved health (Dupre & Meadows, 2007). However, analyses of the older Health and Retirement Study cohort do not entirely support this expectation (Hughes & Waite, 2009). We also consider only two health outcomes but acknowledge that the association between marriage and health outcomes could be more heterogeneous in the case of mortality or distress, as documented in past studies (Choi & Marks, 2011; Williams et al., 2008). Although our analysis included weighting, it did not include adjustment of the standard errors for the complex survey design, which might have further reduced the statistical significance of the associations we describe between marriage and health. Last, our analysis was limited by possible sample selection bias due to the sampling of a single birth cohort, exclusion of ineligible respondents, loss to follow-up, and exclusion of respondents missing data on the outcomes and covariates.

Despite these limitations, our study extends an active line of inquiry into the health consequences of marriage. Recent studies have questioned whether marriage indeed protects health and sought to identify groups for which it is most beneficial (Kalmijn, 2017; Kroeger, 2017; Williams et al., 2015). An underlying assumption of marriage promotion, that the benefits of marriage are strong and consistent across people, reoccurs as a foil in these studies. Addressing this argument directly, we find that the association between marriage at age 40 and two measures of health status is modest and surprisingly similar between people who are more likely to be married and people who are less likely to be married. When confining our definition of marriage to continuous marriage, we find some evidence that this association is stronger for men who are more likely to be continuously married. Yet, even in this group, differences in health associated with continuous marriage are substantively small. Together with other research documenting small and inconsistent benefits of marriage to health (Averett, Argys, & Sorkin, 2012; Frech et al., 2016; Musick & Bumpass, 2012; Zheng & Thomas, 2013), our results challenge the capacity of marriage promotion to improve public health (Waite, 1995). Applying our analytic framework to other theorized benefits of marriage, such as greater financial security, may provide a comprehensive update on the value of marriage promotion policies.

Note

An earlier version of this article was presented at the Population Association of America 2014 Annual Meeting in Boston, MA.

Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Appendix A. Stratum-specific standardized differences between married and unmarried respondents.

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