Partnership, parenthood, and cardiovascular risk among young adults

Adrianne Frech (The University of Akron)[1]
Jamie L. Lynch, Ph.D. (St. Norbert College)[2]
Peter Barr (The University of Akron) [1]

[1] Department of Sociology, The University of Akron, 247 Olin Hall, Akron, OH 44325-1905 (afrech@uakron.edu; pbb2@zips.uakron.edu).
[2] Department of Sociology, St. Norbert College, 454 Boyle Hall, 100 Grant Street, De Pere, WI 54115 (Jamie.Lynch@snc.edu).

Running head: Partnership, parenthood, and cardiovascular risk

Structured abstract

Objectives: Although social relationships such as marriage and parenthood are often seen as health-protective, these events are also often associated with cardiovascular risk factors, most notably increases in BMI and cholesterol, odds of hypertension, and systolic blood pressure (SBP). However, it is unclear whether romantic cohabiting unions and dating relationships are also associated with these risk factors, or whether unions and parenthood – when examined separately – differ in their risk profiles. We examine the relationships between marriage, cohabitation, dating, parenthood, and several indicators of cardiovascular risk. We consider both same-sex and opposite-sex relationships in our analyses.

Methods. Using the National Longitudinal Survey of Adolescent Health, we examined union and parenthood differences in systolic blood pressure (SBP), diastolic blood pressure (DBP), C-reactive protein, and glycated hemoglobin (a measure of pre-diabetes) among young adults ages 25-33.

Results: Relative to those married to opposite-sex spouses, same-sex dating for women (systolic only) and men (glycated hemoglobin only) was associated with increased cardiovascular risk. Same-sex cohabiting women also reported lower levels of CRP relative to married women. After adjusting for other covariates, parenthood was associated with lower systolic and diastolic blood pressure among women.

Conclusions: Unions and parenthood are not strongly associated with cardiovascular risk for young adults. Only same-sex cohabiting women reported greater systolic blood pressure than married women, and same-sex dating men reported greater risk of pre-diabetes. Apart from this, opposite-sex cohabiters and same and opposite-sex daters were not substantially different from married peers at this life course stage. Parenthood was not a risk for men or women, and was associated with lower blood pressure among women.

Introduction

Researchers have long documented the health benefits of social relationships such as marriage, often finding that the married report lower levels of mortality, fewer risky behaviors such as smoking or drinking, and greater socioeconomic resources that help to maintain good health (Umberson, Crosnoe, and Reczek 2010; Burke et al. 2004; Harris, Lee, and DeLeone 2010; Nomaguchi and Bianchi 2004). More recently, scholars have begun to uncover health *penalties* of social relationships early in the life course -- including marriage but also cohabitation and parenthood -- many of which are attributable to increases in BMI and declines in physical activity following union formation or the transition to parenthood (Bellows-Riecken & Rhodes 2008; Burke et al. 2004; Harris, Lee, and DeLeone 2010; Nomaguchi and Bianchi 2004). This body of research has found that for the married, cohabiters, or new parents, blood pressure and BMI are often greater, smoking or drug use may increase, and physical activity is less frequent and shorter in duration (Burke et al. 2004; Harris, Lee, and DeLeone 2010; Nomaguchi and Bianchi 2004). As scholars continue to document the chronic health conditions associated with these risk factors in early adulthood (see Harris 2010), it remains important to understand the ways that social relationships may both benefit and compromise well-being. The goal of this study is to examine whether biological risk factors such as systolic and diastolic blood pressure, C-reactive protein (a measure of inflammation), and glycated hemoglobin (a measure of pre-diabetes) are associated with dating, cohabitation, marriage, or parenthood for young men and women.

Background

Marriage and other social relationships may appear to be less beneficial for health now than in the past due to the expanding scope of outcome variables that are now used to compare the married to individuals not in these relationships. Scholars' increasing access to biomarkers of cardiovascular risk that were previously available only in community studies or clinical populations have led to rapid growth in research investigating social relationships and health risks such as hypertension, increasing waist circumference, BMI, and cholesterol. Though it may be the case that the married fare worse across some of these cardiovascular indicators, on average, marriage itself appears to be no less beneficial for health than it has been in the past (Liu & Umberson 2009). At the same time, increasing rates of nonmarital fertility and cohabitation make it important to examine the ways that a more diverse array of social relationships – not only marriage but also cohabitation and dating, in both same and opposite-sex relationships – are associated with biological risk factors during young adulthood.

Biological indicators of health, personal relationships, and stress

Systolic and diastolic blood pressure (hereafter SBP and DBP) are valid and reliable predictors of future morbidity and mortality. Hypertension – a systolic score of greater than 140 or a diastolic score greater than 90 -- in young adulthood is somewhat rare but particularly damaging, as over time many young adults experience declines in the behaviors that would otherwise improve blood pressure, such as maintaining a healthy weight. Similarly, high levels of C-Reactive protein (CRP), a marker of inflammation, or glycated hemoglobin (HbA1c), a measure of pre-diabetes risk, are relatively rare for young people but indicative of a stress response that may have social causes.

To the degree that social relationships are protective of stress and help to manage health, we expect that those who are dating, cohabiting, or married will report lower CRP and HbA1c. Social risk factors related to socioeconomic status, psychological well-being, social relationships, and stressful life events may ward off hypertension by providing individuals with a sense of self-worth and motivation to engage in good health behaviors, making it more likely than an individual will maintain a healthy weight, engage in physical activity, and avoid a diagnosis of diabetes, the proximate factors leading to hypertension (Falkner et al. 2008; Geronimus et al. 2006; Yan et al. 2003). Structural resources that position individuals in a social hierarchy, such as income, employment, and education, shape individuals' environments by providing access to health insurance, job stability and higher job satisfaction, safe neighborhoods, and time and monetary resources that make it more likely for an individual to exercise regularly and eat healthfully [Link & Phelan 1995]. Each of these resources deter the likelihood that one will develop high blood pressure as a young adult (Falkner et al. 2008) and are more common in social relationships such as marriage and (to a lesser degree) cohabitation.

Differences by sexual minority status

Scholars have recently documented the biological toll that occupying a sexual minority status may take on health, showing that men and women identifying as sexual minorities are at greater risk of STIs, forced sexual encounters, hypertension, and unhealthy BMI, yet to our knowledge no study has documented whether close personal relationships mitigate these differences (Katz-Wise et al. 2014; Everett & Mollborn 2014; Mojola & Everett 2012; Hatzenbuehler, McLaughlin, & Slopen 2013). This is surprising, given the strong protective effects of close partnerships on health for many adults (though weight-related indicators are an exception). We add to this research by examining the relationships between CRP, HbA1c, and SBP/DBP across same and opposite sex dating and cohabiting couples and opposite sex married couples.

Data and Methods

The restricted-use version of the National Longitudinal Study of Adolescent Health (Add Health) is a multiwave panel study of adolescents that began in 1994 and was most recently fielded in 2008. As our study is an analysis of existing data, we obtained only the required IRB exemption from review in order to gain access to the data, which are available via the Interuniversity Consortium for Political and Social Research (ICPSR) at The University of Michigan. Over 75% of the Wave I sample interview at Wave IV, of whom only 2% decline to provide biomarkers of health. Our sample excludes women who are pregnant at Wave IV or believe they might be pregnant, those who are missing sample weights at Wave IV, and those who are not in a same- or opposite-sex dating, cohabiting, or married partnerships. We impute missing data for other explanatory variables (but not dependent variables) among those who interview at Wave IV using the *ice* command for multiply imputed data in Stata 12.

Measures

Dependent Variables. *Systolic and diastolic blood pressure (SBP, DBP)*. Blood pressure is measured between one and three times at Wave IV by a trained interviewer. SBP and DBP are each coded as the average of the second and third trials for nearly all respondents (about 97% of the sample), and any two available trials if three are not available. For about 1% of respondents, a single trial is recorded. *C-reactive protein*. CRP is logged and measured continuously; higher scores indicate greater inflammation and cardiovascular risk. *Glycated Hemoglobin*. HbA1c is a measure of pre-diabetes in healthy samples, higher scores indicate poorer glucose metabolism and risk of Type-II diabetes. HbA1c is trichotomized in multinomial logistic regressions such that 1= prediabetic; 2=diabetic, and 0=low HbA1c [reference].

Independent Variables. *Union and Parenthood status*. At Wave IV, individuals are assigned to one of six mutually exclusive and exhaustive categories of union status according to self-reports of current relationship status, including opposite-sex marriage (reference), same-sex cohabiting, opposite sex cohabiting, same sex dating, and opposite sex dating. Analyses are gender-stratified by main respondent. Parenthood is measured such that 1= lives with a biological or step-child according to the Wave IV household roster.

Control variables. *Body Mass Index (BMI)*. Models adjust for BMI (centered) at Wave IV. *Race-ethnicity, age,* and *gender* are self-reported at Wave I. *Socioeconomic status during young adulthood* is evaluated with the respondent's educational attainment at Wave IV.

Analytic strategy

We estimate associations between social relationships and cardiovascular risk during young adulthood using gender-stratified models that are weighted to reflect Add Health's complex sampling design and attrition since Wave I. Linear regressions are used to examine systolic and diastolic blood pressure (SBP, DBP), which are normally distributed. CRP is logged and analyzed continuously. HbA1c is analyzed using multinomial logistic regressions where the reference group is healthy HbA1c and categories of interest are diabetic and pre-diabetic.

Results

Women

Systolic Blood Pressure

Beginning with the results in Table 1 for systolic blood pressure for female respondents, the first model compares group differences across the different relationship types with no other covariates in the model. Only same-sex daters show any significant differences. Compared to opposite-sex married respondents, female same-sex daters have a systolic blood pressure that is 4.923 ($p<.001$) points higher on average. Moving on to the second model for women, it becomes apparent that the difference between these two groups becomes even greater once we control for BMI, with same-sex daters having a 6.018 ($p<.001$) greater systolic blood pressure on average. This suggests that the effect of BMI was masking some of the differences between opposite-sex married and same-sex daters. After controlling for BMI, both opposite-sex cohabiters (b=1.217, $p<.05$) and opposite-sex daters (b=1.390, $p<.05$), also demonstrated significantly higher systolic blood pressure compared to opposite-sex married, but these differences are not as severe as in the case of female same-sex daters.

When we look at Model 3, we can see how the inclusion of age and parental status impacts these group differences. For women, we see that the result for same-sex daters has been reduced (b=4.932, $p<.001$), though still significant. The effect for opposite-sex cohabiters has been reduced to marginal significance (b=1.002, $P<.10$) while the effect for opposite-sex daters disappears. Female respondents who are parents showed significantly lower systolic blood pressure compared to those who were not parents (b=-2.270***, $p<.001$), while age was positively related to systolic blood pressure (b=.301, $p<.05$). The final model includes all of the previous covariates as well as differences across racial groups and levels of education. The marginal significance of opposite-sex cohabiters disappears, however the impact for same-sex daters though once again reduced (b=4.283, $p<.01$) is still significant. The effects for age (b=.309, p<.05) and being a parent (b=-2.670, p<.001) both become slightly stronger when including controls for both race and education. Looking at the differences across race, compared to white women, Black women have marginally higher systolic levels (b=1.057, p<.10) while Hispanic women have systolic levels 1.471 (p<.05) *lower* than white women. Among the covariates for education, having a high school diploma or equivalent resulted in a systolic blood pressure that was greater than those with a college degree or more by 1.424 (p<.05) points on average. Overall these variables explain roughly 15% of the variation of systolic blood pressure for women.

Diastolic blood pressure

Table 2 shows the results for the effects of different variables on diastolic blood pressure. Once again looking at the results for female respondents, Model 1 compares the differences across relationship groups. When looking at these groups with no other covariates, none of them differ from opposite-sex married women in any significant manner. After controlling for BMI in Model 2, we see some of these results change. With the effects of BMI held constant, opposite-sex daters (b=1.201, p<.05) and same-sex daters (b=2.473, p<.05) demonstrate higher diastolic blood pressure levels, and opposite-sex cohabiters have marginally higher levels (b=.806, p<.05). These relationships change again in Model 3 as the associations for both opposite-sex daters and same-sex daters are reduced to marginal significance, while the effect for opposite-sex cohabiters moved from marginal to significant (b=.869, p<.05). As in the results for systolic, age is positively associated with diastolic blood pressure (b=.473, p<.001), while being a parent seems to be a protective factor against higher diastolic blood pressure (b=1.308, p<.001). Model 4 once again includes variables for race and education. After race and education are held consent, all of the differences across relationship statuses are reduced to non-significance. Instead we see that

Black women have slightly higher diastolic blood pressure levels on average (b=.907, p<.05), and that compared to those with a college degree or more those with a high school diploma or GED (b=1.145, p<.10) and those with less than a high school education (b=.1417, p<.10) have marginally higher diastolic levels. This suggests that group differences in diastolic pressure seen in the earlier models may be due to compositional factors of the groups and selection into these types of relationships. These variables explain just under 9% of the variance in diastolic blood pressure. Having looked at blood pressure for women, we can now examine how these covariates are similar or different for men.

Beginning once again in Model 1 of Table 1, we can see the raw group differences across relationship statuses for men. Without other covariates in the model, none of the groups differ from opposite-sex married in any significant way. These results do not change when BMI is added in Model 2. In Model 3, the inclusion of age and parental status lead to a marginally significant difference for same-sex cohabiters (b= 3.337, p<.10) and significant differences for opposite-sex daters (b=1.511, p<.05) compared to opposite sex married. However, neither age nor being a parent had any significant impact on systolic blood pressure as it did in the models for female respondents. Finally, including race and education variables, the coefficient for same-sex cohabiters increases slightly, though is still only marginally significant (b=3.846, p<.10) and the coefficient for opposite-sex daters is reduced slightly, though remains significant (b=1.463, p<.05). The only racial difference is between white and Hispanic men, with Hispanic men having a systolic blood pressure 1.639 (p<.05) points lower on average. None of the educational variables explain differences in systolic blood pressure for men as they did in the final model for women. With few significant associations it should not be surprising that this model explains only about 8 % of the variation in men's' systolic blood pressure.

Finally, moving on to the models for diastolic blood pressure in male respondents, we can see in Model 1 of Table 2 that there are once again no initial differences between relationship groups. The inclusion of BMI in Model 2 does not change any of these relationships. With the inclusion of age and parental status in Model 3, we can see that age is positively associated with diastolic blood pressure in men (b=.530, p<.001). Compared to opposite-sex married, both same-sex cohabiters (b=5.027, p<.10) and opposite-sex cohabiters (b=.847, p<.10) have marginally higher diastolic levels when age and parental status are held constant. The results in the final model for men bear a striking resemblance to the results in the final model for systolic blood pressure. The impact of same-sex cohabiters remains marginally significant (b=5.536, p<.10), while the effect of opposite-sex cohabiting disappears, and the effect of opposite-sex dating becomes marginally significant (b=.966, p<10). Hispanic men once again have significantly lower blood pressure than men (b=-1.301, p<.05), but in this case it is the diastolic blood pressure. Age remains positive and significant, with its impact slightly stronger (b=.542, p<.001). Overall these factors explain just over 7% of the variation in diastolic blood pressure for men.

Glycated Hemoglobin (HbA1c)

Following the guidelines of the American Diabetes Association (2008), levels of glycated hemoglobin (HbA1c) are divided into three different categories: normal (HbA1c < 5.7%), pre-diabetes (HbA1c > 5.7% and < 6.4%), and diabetic (HbA1c > 6.4%). With these categories in mind, the results in Table 3 present the relative risk ratios (RRR) from a multinomial logistic regression comparing both the pre-diabetic and diabetic categories to the normal HbA1C category. Beginning with the result for women and then moving on to men, we will compare the impact of the covariates on the odds of each outcome.

Looking at Model 1 for female respondents in the pre-diabetic category, only opposite-sex daters have higher odds compared to opposite-sex married, and these results are only marginally significant ($p<.10$). However, when we look at the results for those who fall in the diabetic range, almost every group has greater odds compared to opposite-sex married. For women, opposite-sex cohabiters compared to opposite sex-married are more likely to fall into the diabetic rather than normal HbA1c category by a factor of 2.445 ($p<.001$). Same-sex daters are more likely to fall into the diabetic category by a factor of 5.952 ($p<.01$) and opposite-sex daters are more likely to fall into the diabetic category by a factor of 3.101 ($p<.001$). While this model includes no other covariates, it does present some stark differences across groups, especially in regards to the comparison between normal HbA1c levels and diabetic levels. Model 2 controls for BMI. In the pre-diabetic comparison, the difference between opposite-sex daters and opposite-sex married becomes slightly stronger and significant, with 1.377 ($p<.05$) times the relative risk for opposite-sex daters of being pre-diabetic. Holding BMI constant also increases the risk ratios for the diabetic to normal comparison, with opposite-sex cohabiters relative risk increasing to 2.621 ($p<.001$), same-sex daters relative risk increasing to 8.012 ($p<.01$), and opposite-sex daters relative risk increasing to 3.473 ($p<.001$). With the inclusion of age and parenting status in the model, once again the relative risk for opposite-sex daters increases to a factor of 1.429 ($p<.05$) when comparing normal to pre-diabetic levels. Age seems to have a slight impact on the relative risk, but is only marginally significant. In the comparison of normal and diabetic categories, all of the previously significant results once again become slightly stronger, though in these models age has no noticeable impact. Adding race and education in Model 4, he effect of opposite-sex dating on the relative risk for being pre-diabetic for women disappears. Instead we see strong effects for race and education, and a moderate effect for age. All of the racial categories have a higher relative risk of being pre-diabetic when compared to white women. Black women have a 3.703 ($p<.001$) times greater risk, Hispanic women have a 1.925 ($p<.001$) times greater risk, and Asian women have a 2.151 ($p<.001$) times greater risk of being pre-diabetic relative to white women. Similar results appear for the effect of education. Compared to those with a college degree or more, those with less than a high school diploma are 1.742 ($p<.05$) times as likely, those with a diploma or GED are 1.772 ($p<.01$) times as likely, and those with only some college are 1.414 ($p<.01$) times as likely to be in the pre-diabetic category as opposed to the normal HbA1c range. The results for the relative risk of normal to diabetic ranges are even starker. Of the original group differences across relationship type, only the effect of opposite-sex cohabiting remains significant, though it has been reduced (RRR=1.698, $p<.05$).

The differences in these groups seems to have been almost completely explained by racial and educational categories. Hispanic women (RRR= 3.062, $p<.01$) and women who fall into the other racial category (RRR=4.858, $p<.05$) both have significantly greater risk of being in the diabetic levels compared to white women. Even more extreme, Black women are nearly fifteen times as likely (RRR=14.809, $p<.001$) to have HbA1c levels that place them in the diabetic range compared to white women, all other things being constant. Education reveals similar patterns to those in the pre-diabetic comparison. Compared to college graduates and above, those with less than a high school diploma have 3.062 ($p<.05$) times the risk of being in the diabetic range, while those with a diploma or GED are 2.652 ($p<.05$) times as likely, and those with only some college are 1.778 ($p<.10$) times as likely, though this is only marginally significant. Finally, it appears that being a parent provides some protection against being in the diabetic range of HbA1C, lowering their relative risk by a factor 0f .622, though this is only marginally significant.

Men

Beginning again with Model 1 in the comparison of normal HbA1c levels to those in the pre-diabetic range, men in same-sex cohabiting relationships have a lower risk of being in the pre-diabetic category compared to opposite-sex married by a factor of .236 (p<.01). This stands in stark contrast to the risk of same-sex daters, which is 3.409 (p<.01) times that of opposite-sex married men. None of the other relationship groups differ in the initial model. Looking at the Model 1 for the relative risk of normal to diabetic levels, we see again that same-sex cohabiting men are much less likely to be in this category (RRR=.000, p<.001). However, we suggest some caution in interpreting this result. The small number of same-sex couples in our sample combined with the small number of individuals in the diabetic range of HbA1C may be the reason for such an extreme result. Because of this, we are skeptical of the validity of the finding for same-sex cohabiting men in the diabetic range. Male same-sex daters also have a greater risk for being in the diabetic range compared to opposite sex married (RRR=4.011, p<.10), though this result is only marginally significant. After BMI is accounted for in Model 2, the relative risk for same-sex cohabiting men in the pre-diabetic range drops slightly to .299) p<.05, but the risk for same-sex daters increases slightly to 4.031 (p<.01). In the models for diabetic levels, the risk-ratio for same-sex cohabiting men remains unchanged. Holding BMI constant, the relative risk for same-sex daters increases, with a risk greater than opposite-sex married by a figure of 6.261 (p<.05).

Including age and parental status in Model 3 increase the relative risk for same-sex cohabiters in regard to pre-diabetic levels of HbA1c and leaves it only marginally significant. Holding these covariates constant also reveals a significant relationship between opposite-sex cohabiting and risk for pre-diabetic HbA1c levels. Opposite-sex cohabiters are at a greater risk for being pre-diabetic by a factor of 1.221 ($p<.05$). The risk for same-sex daters once again increases, with relative odds 4.838 ($p<.001$) times greater of having HbA1c levels in the pre-diabetic range compared to the nomal range. Being a parent also places men at greater risk, with those who indicated being a parent having a 1.315 ($p<.05$) greater risk of pre-diabetic levels than non-parents. Some of the results change when we look at the relative risks for diabetic levels of HbA1c. Same-sex dating men have a 9.587 ($p<.001$) time greater risk of being in the diabetic levels compared to their opposite-sex married counterparts. Opposite-sex daters are also at greater risk (RRR=2,094, $p<.05$). Age also seems to increase risk in the models for diabetic levels of HbA1C, with each year increasing the relative risk by relative odds of 1.237 ($p<.01$), all other things being constant. In these models, it would appear parenting is once again a risk factor for men (RRR=1.671, $p<.10$), though it is only marginally significant in the diabetic level comparison models.Moving tothe full models in Model 4, being in a same-sex cohabiting relationship once again lowers the risk of being at pre-diabetic levels for men (RRR=.344, $p<.05$) and the risk for same-sex daters, though still significant, is reduced (RRR=4.058, $p<.10$), and the effect for opposite-sex cohabiting has been explained by the racial and educational covariates. Looking at differences across racial categories for men, being Black increases risk of being at pre-diabetic levels of HbA1c by a factor of 4.326 ($p<.001$), being Hispanic increases risk by a factor of 1.629 ($p<.001$), and being Asian/Pacific Islander increases the relative risk by a factor of 3.040 ($p<.001$). Education also has significant impacts on risk of pre-diabetic HbA1c levels. Those with less than a high school degree (RRR=1.605, $p<.01$), those with a diploma or GED (RRR=1.490, $p<.01$), and those with only some college (RRR=1.689, $p<.001$) are all significantly at greater risk compared to men with a college degree or more. Finally, age becomes a significantly associated with risk for pre-diabetes, with each year in age increasing the risk by a factor of 1.062 (p<.05), all other things being constant. Parental status is reduced to non-significance and has no impact on pre-diabetic levels in the final model.

Finally, in the models for relative risk of diabetic levels of HbA1c, we can see that the changes are not as drastic as for the case with pre-diabetic levels. The relative risk for same-sex dating men while still significant, has been reduced once race and education are accounted for (RRR=5.722, p<.05). The effect of opposite-sex dating disappears. Looking at the variables for race, Black men are at 14.013 (p<.001) times the risk for being in the diabetic category compared to white men, while Hispanic men are at 2.387 (p<.05) times the risk, and men in the other racial category are at 4.990 (p<.05) times the risk. None of the education variables are significantly related and the effect of being a parent loses its marginal significance. Finally, we can see that age is positively associated with risk for diabetic levels of HbA1c, with an increase in risk by a factor of 1.202 for every year increase in age and all other things being held constant. These results for men tell us that a large part of the differences across various relationship statuses can be explained by racial, educational, and age related factors that probably play a part in the selection into these types of relationships. Having thoroughly explored the results of glycated hemoglobin, we now move on to the final outcome, C - reactive protein.

C-Reactive Protein (CRP)

C-reactive protein (CRP) is a general measure of inflammation linked to numerous health outcomes. These models represent the OLS regressions of previously explored covariates on CRP. Because CRP is a general marker of inflammation, levels over a certain cut point tend to indicate some acute infection rather than chronic exposure to stress. Following the guidelines of the Add Health data set, values greater than 10 were dropped from analysis. Values ranging from 3 to 10 indicate chronic inflammation. Because of the highly skewed distribution of this outcome, CRP was log transformed and therefore all coefficients should be interpreted as the change in the log of CRP, where higher scores indicate greater inflammation.

As in the previous outcomes, we will begin with the results for women and then move on to the results for men. Model 1 in Table 4 displays the group differences across relationship status groups for women. Women in same-sex cohabiting relationships tend to have lower CRP levels than women in opposite-sex married relationships (b= -.463, p<.01). In Model 2, the introduction of BMI as a covariate leads to an increase in the difference between same-sex cohabiters and opposite-sex married (b= -.485, p<.001) and marginally significant differences for both same-sex daters (b= -.478, p<.10) and opposite-sex daters (b= -.094, p<.10) compared to opposite-sex married women. The inclusion of covariates for age and parental status once again makes these group differences stronger. Same-sex cohabiters (b= -.546, p<.001), opposite-sex daters (b= -.125, p<.05) and same-sex daters (b= -.533, p<.10) are all significantly lower than women in the opposite-sex married category, though the effect for same-sex daters is only marginally significant. Age has no significant impact for women's CRP levels, but being a parent is associated with lower CRP levels for women (B= -.088, p<.05). Finally, Model 4 includes variables for race and education. The associations for both same-sex cohabiters and same-sex daters remain, though are slightly reduced. The effect for opposite-sex cohabiters is explained by the inclusion of race and education covariates. Black women (b= -.159, p<.05) and Asian/Pacific Islander women (b= -.326, p<.001) have significantly lower levels of CRP compared to white women, while Hispanic women (b=.121, p<.05) tend to have higher levels. Education seems to have no impact for CRP levels in women, and after the inclusion of race and education variables, the impact for being a parent has also disappeared. The final model explains just under 22% of the variance in women's CRP. Now we will explore the results for men.

Returning to Model 1 in Table 4, we can see that men who are in the opposite-sex dating category have significantly lower CRP levels (b= -.166, p<.01) and that same-sex cohabiters have marginally lower levels (b= -.244, p<.10) compared to opposite-sex married men. These differences disappear once BMI is included in Model 2. Moving on to Model 3, the differences across relationship group remain non-significant while both age (b=.026, p<.05) and being a parent (b=.160, p<.001) are associated with greater levels of CRP. This is interesting because of the fact that in the models for women, parenting was found to be associated with lower CRP levels, suggesting that CRP may be impacted by gender roles. Finally, the model including education and race demonstrates very different results from the final model for female respondents. None of the relationship groups or racial groups reveal any significant differences for men. However, we see that compared to college educated men, those with less than a high school diploma (b=.319, p<.01), those with a diploma or GED (b=.260, p<.001), and those with only some college completed (b=.182, p<.01) all have significantly higher levels of CRP.

This suggests education may be a protective factor for men and corresponds with the earlier observation that perhaps expectations around certain gender roles serve as protective factors (men who are educated, women who are parents) or more importantly, it may reveal that those who do not conform to traditional gender roles are exposed to greater levels of stress. Finally, the effect of age remains significant and virtually unchanged from the previous model while the impact of being a parent is reduced to marginal significance (b=.084, p<.10). Overall, these covariates explain just under 20% of the variation in men’s CRP levels.

Conclusions

Previous studies have resulted in mixed findings regarding the relationships between union and parenthood status and cardiovascular risk factors. This study adds to existing literature by demonstrating that the relationships between parenthood, marriage, cohabitation, and cardiovascular risk are not strongly associated during young adulthood, *except* for some same-sex respondents. We speculate that at this stage of the life course, health differences are small across groups (though overall incidence is quite high) but likely widen later in the life course. We urge future studies to account for selection into unions when continuing to clarify the relationships between social relationships and young adult health.

References

American Diabetes Association. (2008). Diagnosis and classification of diabetes mellitus. Diabetes care, 31(Supplement 1), S55-S60.

Brummett, Beverly H., Michael A. Babyak, Ilene C. Siegler, et al. 2011. "Systolic Blood Pressure, Socioeconomic Status, and Biobehavioral Risk Factors in a Nationally Representative US Young Adult Sample." *Hypertension* 58(2): 161–166.

Burke, Valerie, Lawrie J. Beilin, Diana Dunbar, and Melodie Kevan. 2004. "Changes in Health-related Behaviours and Cardiovascular Risk Factors in Young Adults: Associations with Living with a Partner." *Preventive Medicine* 39(4): 722–730.

DeSantis, Amy S. et al. 2007. "Racial/Ethnic Diferences in Cortisol Diurnal Rhythms in a Community Sample of Adolescents." *Journal of Adolescent Health* 41(1):3–13.

Geronimus, A et al. 2006. "Weathering" and Age Patterns of Allostatic Load Scores Among Blacks and Whites in the United States." *Am J Public Health* 96:826-833.

Gruenewald, Tara L., Arun S. Karlamangla, Perry Hu, et al. 2012. "History of Socioeconomic Disadvantage and Allostatic Load in Later Life." *Social Science & Medicine* 74(1): 75–83.

Harris, K. M., H. Lee, and F. Y. DeLeone. 2010. "Marriage and Health in the Transition to Adulthood: Evidence for African Americans in the Add Health Study." Journal of Family Issues(April).

Kimm, Sue Y S, Nancy W Glynn, Eva Obarzanek, et al. 2005. "Relation Between the Changes in Physical Activity and Body-mass Index During Adolescence: a Multicentre Longitudinal Study." *Lancet* 366(9482): 301–307.

Halanych, JH et al. 2010. "Alcohol Consumption in Young Adults and Incident Hypertension." *American Journal of Epidemiology* 171:532-539.

Link, B and J Phelan. 1995. "Social Conditions as Fundamental Causes of Disease." *J Health and Social*

Liu, Hui. 2009. "Till Death Do Us Part: Marital Status and U.S. Mortality Trends, 1986 – 2000." *Journal of Marriage and Family* 71(5): 1158–1173.

Mastekaasa, Arne. 1992. "Marriage and Psychological Well-Being: Some Evidence on Selection Into Marriage." *Journal of Marriage and the Famil*y 54(November): 901–911.

Matthews, Karen A., Catarina I. Kiefe, Cora E. Lewis, et al. 2002. "Socioeconomic Trajectories and Incident Hypertension in a Biracial Cohort of Young Adults." Hypertension 39(3): 772–776.

Nomaguchi, Kei M., and Suzanne M. Bianchi 2004. “Exercise Time: Gender Differences in the Effects of Marriage, Parenthood, and Employment.” *Journal of Marriage and Family* 66(2): 413–430.

Okosun, Ike S., K. M. Dinesh Chandra, Simon Choi, et al. 2001. “Hypertension and Type 2 Diabetes Comorbidity in Adults in the United States: Risk of Overall and Regional Adiposity.” Obesity Research 9(1): 1–9.

Ostchega,Y et al. 2008. *Hypertension Awareness, Treatment, and Control.* NCHS Data Brief, no. 3.
Falkner, B et al. 2008. “Blood Pressure Variability and Classification of Prehypertension and Hypertension Adolescence.” *Pediatrics* 122:238-242.

Reckelhoff, Jane F. 2001. “Gender Differences in the Regulation of Blood Pressure.” *Hypertension* 37(5):1199–1208. Retrieved April 3, 2012.

Richardson, Liana J., Jon M. Hussey, and Kelly L. Strutz. 2011. “Origins of Disparities in Cardiovascular Disease: Birth Weight, Body Mass Index, and Young Adult Systolic Blood Pressure in the National Longitudinal Study of Adolescent Health.” *Annals of Epidemiology* 21(8): 598–607.

Steinberger, J et al. 2009. “Progress and Challenges in Metabolic Syndrome in Children and Adolescents.” *Circulation* 119:628-647.

Umberson, Debra, Robert Crosnoe, and Corinne Reczek. 2010. “Social Relationships and Health Behavior Across the Life Course.” *Annual Review of Sociology* 36(1): 139–157.

Williams, David R. “Racial Differences in Physical and Mental Health.” *Journal of Health Psychology* 2, no. 3 (1997): 335–351.

Yan, LL et al. 2003. “Psychosocial Factors and Risk of Hypertension.” *JAMA* 290:2138-2148.

Systolic blood pressure by union and relationship status

	Systolic							
	Model 1		Model 2		Model 3		Model 4	
	Men	Women	Men	Women	Men	Women	Men	Women
Relationship status (reference = opposite-sex married) :								
Same-sex Cohabiting	1.029	1.784	2.84	0.457	3.337†	-0.824	3.846†	-1.252
Opposite-sex Cohabiting	-0.22	0.844	0.239	1.217*	0.5	1.002†	0.284	0.742
Same-sex Dating	0.884	4.923**	2.073	6.018***	2.51	4.932***	2.599	4.283**
Opposite-sex Dating	0.615	0.936	1.072	1.390*	1.511*	0.77	1.463*	0.564
Race (ref = NH white)								
African American	-	-	-	-	-	-	0.031	1.057†
Hispanic	-	-	-	-	-	-	-1.639*	-1.471*
Asian/ Pacific Islander	-	-	-	-	-	-	0.974	0.256
Other	-	-	-	-	-	-	0.081	0.096
Education (ref = BA or higher)								
Less than HS diploma	-	-	-	-	-	-	1.006	1.255
HS diploma or GED	-	-	-	-	-	-	0.555	1.424*
Some college	-	-	-	-	-	-	-0.804	0.453
Age	-	-	-	-	0.197	.301*	0.199	.309*
Parent	-	-	-	-	0.624	-2.270***	0.568	-2.670***
BMI	-	-	.513***	.617***	.508***	.623***	.517***	.609***
N	4911	5809	4869	5754	4861	5749	4851	5737
Model R-Squared	0.001	0.003	0.077	0.142	0.079	0.149	0.083	0.152

†p<.10; *p<.05; **p<.01; ***p<.001

Table 2. Diastolic blood pressure by parenthood and relationship status

	Diastolic							
	Model 1		**Model 2**		**Model 3**		**Model 4**	
Relationship status (reference = opposite-sex married) :	**Men**	**Women**	**Men**		**Men**	**Women**	**Men**	**Women**
Same-sex Cohabiting	3.160	1.149	4.417	.417	5.027†	-.123	5.536†	-.481
Opposite-sex Cohabiting	.073	.565	.395	.806†	.847†	.879*	.743	.633
Same-sex Dating	1.166	1.738	1.975	2.473*	2.421	1.981†	2.745	1.314
Opposite-sex Dating	-.052	.934	.227	1.201*	.872	.976†	.966†	.721
Race (white as reference):								
African American	-	-	-	-	-	-	-.812	.907*
Hispanic	-	-	-	-	-	-	-1.301*	-.746
Asian/ Pacific Islander	-	-	-	-	-	-	1.293	1.436
Other	-	-	-	-	-	-	-.713	.910
Education (College degree or more as reference)								
Less than HS diploma	-	-	-	-	-	-	1.190	1.417†
HS diploma or GED	-	-	-	-	-	-	.776	1.145†
Some college	-	-	-	-	-	-	.321	.455
Age	-	-	-	-	.530***	.473***	.542***	.477***
Parental status (0=nonparent, 1=parent)	-	-	-	-	.563	-1.308**	.477	-1.666***
BMI	-	-	.357***	.348***	.349***	.347***	.351***	.336***
N	4911	5809	4869	5754	4861	5749	4851	5737
Model R-Squared	.001	.002	.059	.076	.070	.085	.074	.089

†p<.10; *p<.05; **p<.01; ***p<.001

Table 3: HBA1C (logistic, odds ratios) - Prediabetic levels (RRR compared to normal levels)

	Model 1		Model 2		Model 3		Model 4	
	Men	Women	Men	Women	Men	Women	Men	Women
Relationship status (reference = opposite-sex married) :								
Same-sex Cohabiting	.236**	1.134	.299*	.798	.365†	.864	.344*	.622
Opposite-sex Cohabiting	1.073	.997	1.127	1.049	1.221*	1.097	1.033	.890
Same-sex Dating	3.409**	1.714	4.031**	1.699	4.838***	1.789	4.058**	1.133
Opposite-sex Dating	.857	1.303†	.916	1.377*	1.069	1.429*	.801	1.041
Race:								
African American	-	-	-	-	-	-	4.326***	3.703***
Hispanic	-	-	-	-	-	-	1.629***	1.925***
Asian/ Pacific Islander	-	-	-	-	-	-	3.040***	2.151***
Other	-	-	-	-	-	-	1.716	1.225
Education								
Less than HS diploma	-	-	-	-	-	-	1.605**	1.742*
HS diploma or GED	-	-	-	-	-	-	1.490**	1.772**
Some college	-	-	-	-	-	-	1.689***	1.414**
Age	-	-	-	-	1.035	1.066†	1.020	1.062*
Parental status	-	-	-	-	1.315**	1.051	1.018	.813
BMI	-	-	1.066***	1.075***	1.065***	1.074***	1.065***	1.064***
N	4513	5491	4465	5438	4458	5434	4449	5424

†p<.10; *p<.05; **p<.01; ***p<.001

Table 4. C-Reactive protein (logged) by parenthood and relationship status

	Model 1		Model 2		Model 3		Model 4	
	Men	**Women**	**Men**	**Women**	**Men**	**Women**	**Men**	**Women**
Relationship status (reference = opposite-sex married) :								
Same-sex Cohabiting	-.244†	-.463**	-.008	-.485***	.110	-.546***	.151	-.511**
Opposite-sex Cohabiting	-.016	.021	.028	.052	.073	.031	.027	.044
Same-sex Dating	-.244	-.412	-.086	-.478†	.014	-.533†	.006	-.486†
Opposite-sex Dating	-.166**	-.090	-.093	-.094†	.003	-.125*	-.026	.090
Race (white as reference):								
African American	-	-	-	-	-	-	.043	-.159*
Hispanic	-	-	-	-	-	-	-.046	.121*
Asian/ Pacific Islander	-	-	-	-	-	-	-.124	-.326***
Other	-	-	-	-	-	-	-.067	-.179
Education (College degree or more as reference)								
Less than HS diploma	-	-	-	-	-	-	.319**	.016
HS diploma or GED	-	-	-	-	-	-	.260***	.029
Some college	-	-	-	-	-	-	.182**	-.054
Age	-	-	-	-	.026*	-.006	.028*	-.006
Parental status (0=nonparent, 1=parent)	-	-	-	-	.160***	-.088*	.084†	-.071
BMI	-	-	.069***	.074***	.068***	.074***	.067***	.075***
N	4110	4443	4075	4402	4068	4398	4061	4391
Model R-squared	.001	.004	.177	.209	.184	.210	.195	.218

†p<.10; *p<.05; **p<.01; ***p<.001