Relating Income to Health with an eye to Marriage

Modeling Cause, Effect, and Selection

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Abstract *Married people live longer than those who are single. Four theories have arisen to explain this: marital benefits, negative selection with benefits, cleaning up for marriage, and positive selection. These theories disagree in the starting point as well as the timing for when benefits begin accruing. Other theories have noted differences between genders in the benefits to marriage, with the balance going towards men. This paper considers a gender-based view of health changes experienced by people undergoing transitions into marital partnerships. Longitudinal data come from years between 1993 and 2003 of the Panel Study of Income Dynamics (PSID). Methods used include graphical and functional analysis in conjunction with OLS and Fixed Effects regression. Results suggest that there is no health benefit to marriage, with selection being stronger than previously thought. Analysis also suggests that there is a post-marital short-term deterioration in female health likely due to childbearing.*

Married people live longer and healthier lives. Two main types of explanation have arisen to explain this trend: health selection, and social causation. Marriage has many benefits including having someone to share problems with, to consult with, and to share duties with have all been put forward as beneficial. But who gets married is often defined by public policy and a complex selective dating process. The question that inevitably follows is whether healthier people get married, or married people get healthier. The second, and less considered question is about when these people become healthier, and how long it takes to accrue benefits in order to become healthy. Four theories deal with this disjuncture between healthy married people and unhealthy singles. A spatial view of these theories can be found in figure 1 below. This study seeks to understand and test these four theories as they relate to the transition between single and married statuses.

Four Theories on Marriage

Marital Benefits

The overall health benefits resulting from marriage "may be as large as the benefit from giving up smoking" (Wilson and Oswald 2005). Waite has been foremost in the research addressing this issue in a number of publications including her presidential address to the *Population Association of America* in 1995 in which she suggests that marriage is highly beneficial for the health of individuals and populations (Waite 1995). Her latest research suggests that benefits to marriage remain strong, though many benefits are still mainly enjoyed by men (Stolzenberg and Waite 2005; Waite and Gallagher 2000). Not only do married people expect more personal care, incumbents have more sex, are happier in general and with their sex, and have more money and feel healthier for it (Idler and Angel 1990). Others have also pointed out that health may benefit not only from the social aspects of marriage but rather because it acts as a sort of health insurance policy for its incumbents (Smith, Frazee and Davidson 2000). Little research considers this in terms of time since marriage, questioning when these benefits begin to accrue. However, we do know that turbulent marital histories are related to lower health, as may be divorce (Wilson and Oswald, 2005). Marital benefits must therefore be assumed to begin at the beginning of the marital period, though there should also be some accrual with time so that more stable marriages provide more benefits with time. In order to understand this change in a temporo-spatial way, curves have been drawn in figure 1.

Health Selection

Selection into marriage is a well studied process; with socioeconomic status, emotion, excitement, knowledge, and stability playing a large role in female choice (Henderson et al. 2005; Henderson et al. 2006; Townsend and Levy 1990). Results regarding male marital choice suggest that physical attractiveness plays a role, that such aesthetic selectors have little correlation with health (Weeden and Sabini 2005). The process of marrying is assortative, and people must therefore appear to be ideal matches in order to be considered as likely candidates to go through the transition with (Fu and Goldman 1996; Hall and Zhao 1995; Stutzer and Frey 2003). Assortative theories in health selection abound, (see e.g. (Goldman 1993; Goldman 2001)) and have significant

influence, but in terms of direct health selection, two possibilities are usually raised: positive and negative selection.

Health selection has two more obvious components, both of which are anticipatory. On one hand, Becker (1980) suggests that when marrying people are more likely to desire mates who have enough energy to perform housework, or to manage the occupational sphere. Findings for positive selection can be found among women, with findings being limited to the first follow up amongst women who were not employed full-time (Waldron, Hughes and Brooks 1996). Yet, if the logic of marital benefits is correct, there is a clear rational desire for those who believe that they need more care to carry out a more active search for partners who fulfill that role through marriage, especially if that possibility comes with health insurance. Negative health selection or "adverse selection" has been shown to be fairly prevalent (Cheung and Sloggett 1998), with people who are sicker or have poorer health behaviors being more likely to get married due to desire for caring partners (Lillard and Panis 1996). Inquiring into the importance of the selective process in the overall findings of benefits to marriage shows an interesting and important possibility: that people who marry may be selected by exhibited health during the dating period prior to marriage.

Behavioral Change

There is evidence suggesting that it may be the pattern of behaviors near (both before and after) times of transition into marriage may appear to be selection but are in reality a function of the changes marked by preparing for the transition itself (Duncan, Wilkerson and England 2006). In their study Duncan *et al*. (2006) find that a significant change in health behaviours in the twelve months (one year) preceding marriage (and one year afterwards) leads to lowered risky behaviours in the drug-using population. In this case, marital status was seen to benefit both partners, though it tends to benefit men, whose riskier behaviors leave them with the most to gain from improvements in health behaviors. Behaviors are therefore one possible criterion that is likely to act as a selector and as a mechanism for causation in this literature (Kiecolt-Glaser and Newton 2001).

The more generalizable process of 'falling in love' may proxy this finding with respect to measures of health as it does with health behaviors above. With many people coming towards a marriage, the anticipatory period is in itself a time of falling in love. Love tends to make people take part in a more diverse set of activities, including increasing time spent in healthy social activities such as meeting more people (the potential spouse's family, friends, *etc.*), and increases in social time with the significant other, heightened happiness around dating someone, *etc*. This period may therefore show anticipatory causal effects that exist prior to marriage. In either case, for a marriage to take place a couple goes through a process in which they both show that they are behaviorally ready and healthy enough, as well as a number of other considerations of social fit, to be marriageable.

The theories presented above all maintain strong scientific support. Together they suggest a variety of possible changes occur both prior to and following the transition to marriage. Some anticipatory effect may be worth considering. Some selection may be at

play, though direction of such an effect may be important. Finally, marital benefits tend to be evident, with outcomes suggesting that some benefit is probable though such benefit in health may differ depending on gender. Thus, four theories emerge from the data. A spatial understanding of these theories can be found in figure 1 below.

********** figure 1 about here **********

In the four theories presented above, marital benefits, negative selection, positive selection, and anticipation causing a 'cleaning up', three major differences are evident: they differ in predictions of average health of individuals before marriage, the size of benefit that either married person receives from the coupling, and finally the time at which the benefits begin to accrue. Differences are often noted to depend on the gender of those in the relationship, with women experiencing fewer benefits from marriage. They all consider marriage as a transition that is situated in a life course. This will be discussed further in the following section.

Health and Marriage in the Life Course

Elder defines the study of transitions and major life events as important turning points in the overall experiences of individuals going through their life courses (Elder 1983). These events are experienced in many different ways, but may contain a kernel of similarity between individuals that may be enlightening for the health researcher. The transition to living with a partner is one life event that is posited to have an important effect on the health of individuals (Elder 1985). The effects of these transitions are experienced differently depending on gender (Denton, Prus and Walters 2004; Goldscheider and Waite 1991). This paper takes an explicit life course view of the marital transition as a determinant of health.

Gender and Health

Throughout the above discussion it is clear that there are significant differences in the ways that health is experienced depending on the gender of the individual. This is true not only in marriage, but rather in general. Women have worse health on average, but they live longer in the developed world (Macintyre, Hunt and Sweeting 1996). There are significant differences in the ways that men and women relate with the health system (Slattery, Kinney and Levin 2004). The multiple roles that women play, especially in marriage, may not benefit them as much as men; while the double burden of working in an occupation and working in the home can raise levels of stress unequally for men and women (Simon 2002). Childbearing and childrearing tend to fall more heavily on women's shoulders, and may also limit their abilities to care for themselves in more extensive ways (Weissman and Olfson 1995). Thus, it is not simply the case the marriage benefits, nor is it simply the case that genders give and receive the same things within the relationship. As such, gender is a highly definitive consideration on the overall reception to the health transition.

Situating the previous three arguments spatially over the life course, the paths evident in figure 1 emerge. These are all amenable to testing using a gendered view of the

life course approach along with longitudinal data. The four major theories may all add something to the argument, but they lead us to testing three hypotheses.

1. *People going through a marital transition will experience health changes in some agglomeration of four predictable ways.*

2. *After going through a marital transition, the newly married will become steadily and consistently healthier as they begin to gain marital benefits*.

3. *The relationship between health and marriage should differ by gender, with benefits being stronger for men than for women*.

Data

The data used for this study come from the Panel Study of Income Dynamics (PSID) in the United States. It is a representative sample of Americans who live in the United States. It is a prospective longitudinal dataset that interviews individuals within households. This study uses data from the PSID for the years between 1993 and 2003. These occur every second year except in 1994, where data was available but was not used in order to keep the time period in the data balanced.

Data from the PSID include parents, children, and the rest of the household. As such, a number of the respondents are children. Children under 18 have been dropped from the analysis due to other restrictions on marriage. Another problem is that many of the respondents are well into the later stages of life. After a while, marriages are much less likely to end in divorce or separation, but become rather likely to end in death. As such, data for people over 70 have been excluded as the relationships and trends near marital transitions are likely to change dramatically with old age. This study uses the ten years of data beginning in 1993 and going through 2003. No more years of data were needed to create the marital patterning necessary for this study, so the most recent observations were used.

Methods

Situating the marital point in the life course is a difficult problem on its own. It is a transition that occurs to many if not quite all of the populations at hand, though in very different ways and at very different times. Due to the theorized nonlinearities owing to an intermingled set of processes, time and transition were critical factors in these analyses. This presented the researcher with an interesting problem that lead to a somewhat novel answer. The following method uses a lengthened variant of the "Difference of Differences" method (Ashenfelter and Card 1985) by considering the counterfactual problem (as seen in (Morgan and Winship 2007)) in a manner that attempts to use an analytical form of descriptive demographic research (Duncan 2008).

Consider an experiment. We first start with a group of randomly selected respondents. During the experiment one set is given the exposure while the other is not. Measures are often taken both before and after the experiment. Clearly, this is unethical for social research as we cannot 'give' people the exposure 'randomly' of marriage or

retirement. However, if we consider any randomly chosen individual then life can be thought of as a rather short and brutish experiment. If we capture changes in their lives through a process of repeated observation, then what we will observe is a small portion of this experiment. If we think of how the social transitions such as marriage exists when aggregated as in social data, it can be seen that due simply to time that we will gather information on five sorts of 'experiments in life': previously completed experiments; a control group without the exposure; a group whose exposure was completed during the period of time being measured; and since you can leave the experimental group the two other groups that exist are those who leave, and those who both enter and leave in the period being measured. These represent a random sample of all such transitions, and they represent a somewhat counterfactual set of observations as many of these individuals could easily have married someone else who remained single.

The basics of this approach involve reorganization of the data so that the marriage is placed in the center of the inquiry. Orienting time around the centre point to form an overlapping mass of single experiments has its benefits. This allows us to test clearly the four theories outlined above, while also allowing us to formulate a variety of control groups. Two control groups were used for this study. The first is that of people who were already married, while the other is that of those who remained single throughout. Of all the people who got married in the USA, this temporally select group, if representative of the population, will be representative of the population as a whole and is a representative sample of the marital experiences. For these individuals, we have measures for up to ten years preceding and ten years after the marital transition. This will allow the range of health trajectories to emerge, and a generalized statement to be made.

Measures

Complete data was not necessary since results can be obtained quite easily for unbalanced data. However, in an effort to be conservative with measures, analyses shown here use data from respondents who responded in all years. This allows me to make the difference between people who were married throughout and those who may have switched or changed in the period for which we have no measures. Measures of income have been imputed to increase response rates after controls, though no other variables were imputed due to low rates of non-response. Table 1 shows the resulting means and averages for the independent and dependent variables.

********** (Table 1 about here) **********

Health

Self-Rated Health (SRH) is a good measure of and individual's general health. SRH has been shown to be correlated with both morbidity and mortality at all ages and socioeconomic statuses (Burstrom and Fredlund 2001; Mossey and Shapiro 1982). SRH is better for analyses such as this one as it gives a spread of health even for those who have not had any disease, making their inclusion in the analysis more meaningful. Health is coded on a five point scale from excellent (1) to poor (5). It is available in the PSID for the 6 time periods from 1994 to 2005. Health has been treated as continuous.

Partnership Status

In the PSID, a person is in a relationship when they are living in the same household and respond as married. I do not control the types of separation – possibly divorce or separation.[1] This paper must necessarily assume a uniform distribution of marriage over the years, such that marriage falls evenly between two discordant years. In order to create a clear transition, a new variable was required that situated individuals with respect to their marital status and not temporally. Turbulent marriages and rapid change are not good for health. Moreover, people who waffle into and out of relationships are likely to experience marriage and divorce differently than are those who are in it for some time, thereby changing the selection argument; and they are concurrently less likely to gain any benefits from marriage due to the brevity of the experience. As such rapid changes have been excluded from analysis. Similarly, divorce has a range of possible explanations that differ in purpose and in background from marriage and so divorcers have been excluded from analysis.

Gender is a common variable of interest in studies both of the family and in studies of health. The literature has suggested that inequalities in health are not only felt on average, but are also important to the overall direction and strength of relationships. Women and men experience health differently. They also get married for different reasons. Finally, their roles differ both in and out of marriage significantly. As such, all analyses have been separated by gender to make analysis more complete.

Control Variables

Age was measured as time since the date of birth, and was coded in the PSID itself. Analyses have been limited to the population at risk of getting married, which for the purposes of this study has been designated at being between 18 and 70.

Education is consistently shown to be important to health. Education is measured in three categories (those with less than high school, those who have a high school education, and those who have more than high school education). Those having less than a high school education are used as the reference category throughout.

Race in the United States has been shown to be important to control for when considering both health and marriage (Williams 1997). In this, being black is included as a control variable.

Income in the PSID is a measure of post-taxation income for the individual and the family. Both family income and individual income has been suggested to matter for the health of the individual. As such, income deciles and household income deciles have been adjusted for in the analysis.

Results

[1] The inclusion or exclusion of widows does not make any significant difference to the findings if only because of the lack of cases. They have been left out of the analyses due to a lack of genrealizable finding.

Figure 2 shows the preliminary graphical analysis of marital patterns. It suggests that there is a change that precedes the transition to partnered live-in relationships. The relationship goes in the expected direction, suggesting that there is something about dating that is healthy to individuals. The period prior to partnership shows better average health and increases in health leading up to and for a period after, the beginning of a stable partnered relationship. The transition seems to be followed by a marked decrease in health regressing back towards a mean, then rising up again near the end. The two relationships almost mirrored each other.

********** (Figure 2 about here) **********

Towards leaving the relationship, there is a consistent drop in the health of the males in the population followed up by a strong swing up towards the beginning mean, suggesting a reverse sort of temporally bound bad health. Neither of these trends seems to be stable, though both seem to result in the end in better than average health, suggesting a sort of transitional break that is not determinant, but rather a jog in the overall protection that partnership generally affords men. Female patterns are similar, if less dramatic. They are also characterized by a swing effect in the expected direction, though there is very little difference in either women or men towards the end of the period.

Analyses suggested a linear or curvilinear relationship slightly prior to the transition point, with other changes in the trajectory before and afterwards as well. Analysis suggests the functional form for marital transitions to be similar in either direction. The following functional format, denoted as equation (1), was used:

$$(1) \qquad \xi(x) = \alpha + \beta_1 x + \beta_2 x^2 + \beta_3 \tanh(1/2*x) + \varepsilon$$

This nonlinear regression supports the larger and more interesting graphical analyses in general. Specifically, it supports the finding that women get worse after marriage in the USA, and shows that this is a statistically significant nonlinearity near the period of marriage. It also supports the larger pattern of differences between groups as found in the graphical analyses.

Discussion

This study replicates some findings that stand out of the previous literature. Firstly, men's SRH is better on average than is women's. Similarly, differences between married women and never-married women are smaller on average than those between married and never-married men. Finally, we find that single people's health *declined with time when controlling for age* as was found in. This study also shows findings that question or clarify disagreements between arguments in the literature. The first is the argument between health selection and social causation with respect to marital benefits. This will be dealt with in the following sections.

Marital Benefits

Results do not support previous findings reporting gains in SRH due to marriage. Instead, it is easy to see that while married people are healthier, that this is in large part

due to their elevated health before marriage for all parties. Marriage may thus come with benefits, as Waite (1995) shows thoroughly, but it is also a highly selective process. Thus, these benefits do not seem to systematically increase health in the first ten years following marriage.

Two findings stand out in terms of marital effects to health: men just before and after marriage and women in the two to seven years following marriage. Health trajectories for men were mostly stable around marriage. However, there was a significant anticipatory betterment in SRH just prior to marriage. This slight gain was lost rapidly in the three years after marriage. This information supports the generalized hypothesis as put forth by Duncan *et al* (2005), suggesting that men undertake more healthy behaviors in the period leading up to marriage. This gain was rapidly lost after marriage, suggesting that these gains are not permanent.

Women between t + 2 and t + 7 years following marriage show a significant reduction in SRH.[2] This period coincides with an elevation in probability of childbearing and children living in the household. Most significantly, it proxies the exact time it takes to have a child, raise it for 3 years, have another, and raise it for 3 years. This reduction in SRH is followed by an increase in SRH after the seven-year mark.

Selection

Results go against Lillard & Panis' (1996) view of the importance of negative health selection into marriage, supporting instead the positive selection hypothesis put forward by Waldon *et al* (1996). Negative selection, if pertinent, does not seem important enough to determine the overall population's health. It is still possible that a small proportion of the population experiences negative health selection, but with such strong and robust findings of positive selection, this is not likely to be a large proportion of the overall population. Positive selection is strongly related to health differences after marriage. In fact, little change in self rated health after marriage as compared to before. This study supports the thesis that health is a direct consideration when finding a spouse.

What we Might Miss

Many other studies have focused on similar topics but have taken different approaches. This might lead to a number of misunderstandings that may be made clearer here. The first and most obvious is that there is a large benefit for men in getting married. If we consider prior health, there is no gain to being married. Rather, there is a loss to being single. This is a consideration worth noting as it implies that more could be done for those whose marital prospects are lower.

Secondly, we might also conclude that women show less benefit, and if we consider some measure of selection, that they actually get worse. This does not seem to be the case. Rather, women start off less unequal in health, and while the health of single women does decline with time, it never reaches the inequality that is evident at first among men. Similarly, while it is apparent that health gets worse, it is not a permanent

[2] Results not shown here. Time greater than t+5 was left out of analysis for simplicity.

state as it disappears after the childbearing years are over. This is a period of time that holds a variety of stressors specific to women, and as such they feel less healthy. However, these women do regain that health after a period of time. This study does not show conclusive evidence that such is related to childbearing, but the implication in timing is fairly clear and is a topic for consideration in the future.

Limitations

There are some clear limitations to this paper. The first was the requirement for clear transitions. It would have been cleaner if all transitions happened once and thus I could have more easily used all the data available. This was not true of the dataset used, and would not approximate reality. Rapid switching was not accounted for, with only people experiencing at most 1 transition being studied. Turbulent marriages are often attributed with being correlated to increased mortality (Tucker et al. 1996). The health trajectories for those who experienced 2 or more spells will be an interesting study, and is likely to vary by time in marriage, but without this clarity an overarching pattern would be impossible and as such these people must be considered separately. This selection is likely to increase the likelihood of having individuals who experience more benefits from stable marriages (Lillard and Waite 1995). This should have limited systematic effects on health selection in the sample.

The use of SRH is often put forward as a limitation due to bias or 'subjectiveness'. Claims of limitation are often argued to be untrue as measures of SRH are unbiased (Groot 2000) or because they are related to mortality and morbidity (Idler and Angel 1990; Idler and Kasl 1995; Idler and Benyamini 1997). The use of SRH in this type of study is required. Other measures often used for health, including measures of illness, mortality, or even BMI all fail from the simple fact that they do not assess 'health' but rather assess the onset of 'illness'. Due to the nature of selection, using illness as a measure cannot be definitive because it is a sticky label – a person who has a heart attack will go through the rest of their lives as having had a heart attack; a person who is dead by definition does not live. BMI is useful, but it ignores the possibility that high BMI people can still be healthy. SRH is special because it gives the researcher an opportunity to follow what changes are evident at time points coinciding with other life course changes, and can thus be an important measure of how small health changes can be affected by other social phenomena.

Policy Implications

In this paper, we have seen that the transition point can affect the health of individuals in a somewhat predictable but curvilinear way. We know that married people are in better health and live longer than never-married people. Marital selection processes were show to be the prime result, suggesting that supporting or creating differential policy measures encouraging marriage are likely to show little or no results. More pressing is the possible benefits that could be gained, and are ultimately lost, due to the period surrounding marriage for men. This period could give us valuable insight into what does effect significant changes in health. Similarly, it is important to maintain and possibly extend post-childbearing support for mothers.

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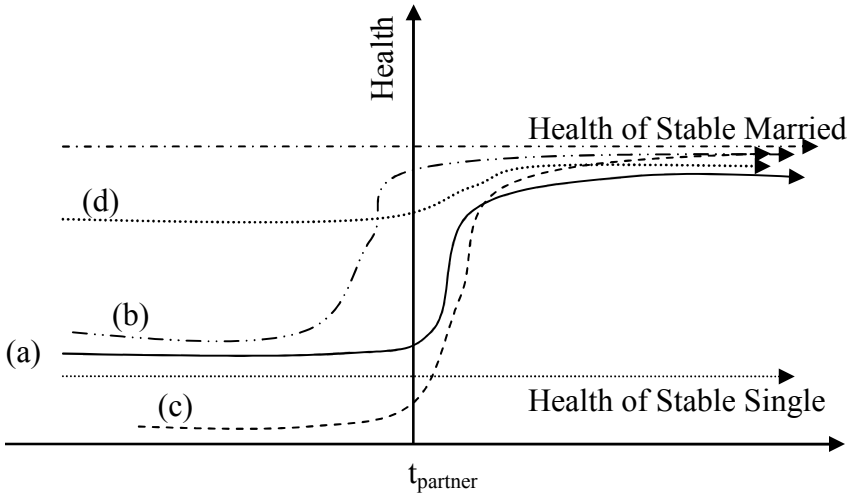
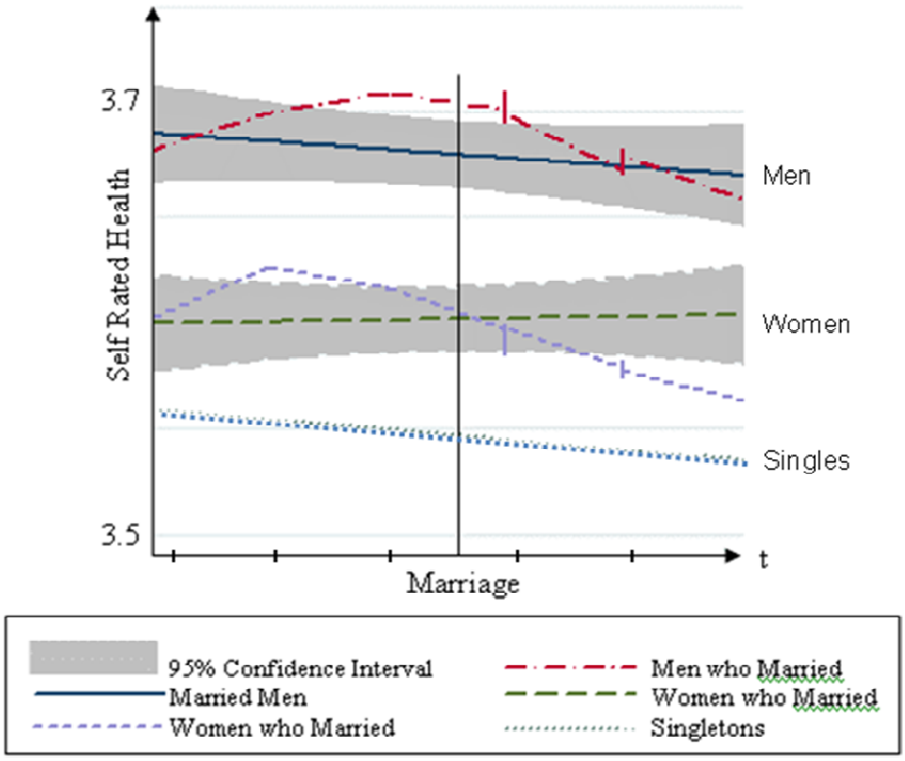
Figure 1. *Differing Explanations for Marital Benefits*



(a) Waite – Marriage as beneficial
(b) Duncan *et al.* – Behavioral Change for Marriage
(c) Lillard & Panis – Positive and Negative selection with benefits
(d) Waldron *et al.* – Positive selection

Figure 2. *Five-year Curves of SRH on Gender and Marital Transition*



*Results show have been standardized for age, black, employment status, household income deciles, and education.