Remarriage After Divorce and Health in Later Life: Findings From CHARLS in China

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Abstract
Marriage has a positive effect on health. After the dissolution of a marriage, the health of divorcees worsens. This study focuses on whether remarriage can help a person regain the health benefits that comes with marriage. Using national baseline data from the China Health and Retirement Longitudinal Study (CHARLS), which conducted from 2011 to 2012, this article applies instrumental variables (IV) method to investigate the association between remarriage after divorce and late-life health. We found that, compared with divorcees who had not remarried, those who remarried suffered less from depression and had better self-rated health. There were gender differences in the relationship between remarriage after divorce and mental health. Remarriage can improve the mental health of men, but there is no significant correlation between remarriage and the mental health of women.

Keywords
ADL impaired, depression, instrumental variable, remarriage after divorce, self-rated health

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Background

Marriage has a protective effect on health because it provides resources that are beneficial to health (Williams & Umberson, 2004; Liu & Umberson, 2008). For example, the social, economic, and psychological resources shared by married couples will provide certain protective mechanisms for physical health (Martikainen & Valkonen, 1996; Waite & Gallagher, 2000; Umberson et al., 2010), through the supervision and mutual care associated with the married state (Wyke & Ford, 1992; Umberson, Crosnoe, & Reczek, 2010; Zella, 2017). However, the dissolution of marriage breaks the protection mechanism. This does not only cause psychological trauma but also affects the physical health of divorcees who suffer poorer mental health (Lindström, Martin & Rosvall, 2012), higher levels of depression (Romans, Cohen & Forte, 2011) and higher suicide rates (Masocco et al., 2008), higher risk of death (Sbarra, Law, & Portley, 2011), stroke (Andersen & Olsen, 2018), and acute myocardial infarction (Dupre et al., 2015).

If divorcees were to remarry, would their new marriage relationship still have a protective effect on their health? Existing research on the health-protective effect of remarried is not entirely consistent. For example, in terms of the relationship between remarriage and depression, there is no significant difference in the degree of depression between remarried people and people married for the first time (Waite, 2009). However, studies also show that remarried people are more depressed and more anxious than people married for the first time (Barrett, 2000; Hughes & Waite, 2009). Considering different age groups, remarriage has been shown to improve the health of young people, but the improvement is not obvious for elderly people (Williams & Umberson, 2004).

Existing conclusions of the relationship between remarriage and health are inconsistent. It may be the result of the selection effect of remarriage. Healthy people are more likely to remarry after divorce, so the effect of remarriage on health may be the result of healthy choices, rather than marriage protecting health. This selection bias will result in endogenous issues. The instrumental variables method is a common way to deal with the endogenous issues. This approach is used to determine the exogenous variation in the relationship between marriage and health and to estimate causal conclusions. We can see the true correlation between the remarriage and health by using a valid instrumental variable to discover the hidden (unobserved) correlation.

This paper attempted to investigate the true correlation between the remarriage after divorce and health in the Chinese context. Specifically, using instrumental variables method analysis of the data from the National Survey of the China Health and Retirement Longitudinal Study (CHARLS) conducted from 2011 to 2012, we proved that remarriage had a protective effect on health.
for people that had been divorced. We started with a review of the literature, then proceeded on with the data and methods, the results, and finally, our conclusions and limitation.

**Literature Review**

*Marriage and Health*

There is “protective effect” of marriage on health in the marital relationship, and the social resources, economic resources, and psychological resources shared by spouses have health protection mechanism (Umberson, Thomeer, & Williams, 2013), which conveys beneficial information through supervision, mutual care, and support of the spouse to promote the health of those who are married.

According to the marital resource model, marriage improves the health of individuals by increasing access to economic, social, and health-promoting services (Waite & Gallager, 2000; Rendall et al., 2011; Stimpson, Wilson & Peek, 2012; Umberson et al., 2013; Rodgers et al., 2019). Husband and wife live together, share family relationships, economic status, and marital quality; share a healthy lifestyle; share and use health services; share risk attitudes; and these shared resources will improve the health of couples in marriage (Drefahl, 2010; Boyle et al., 2011; Umberson, et al., 2013; Liu & Waite, 2014; Reczek et al., 2014). There is no direct causal relationship between marriage itself and health, but rather a closer link between resources and health, so studies show that married people are healthier than unmarried people (Qian, 2016).

Marriage provides emotional support to improve the health status between husband and wife. In the marital relationship, husband and wife provide daily life care, spiritual comfort, and jointly prevent the occurrence of various accidents and diseases (Hughes & Waite, 2002). Emotional and daily life interactions between couples can cushion stress in life and reduce the incidence of depression and mental illness (Waite & Gallagher, 2000; Santini et al., 2015). Attachment security in marriage has been linked to the improved mental health of both husband and wife (Merz & Consedine, 2009; Monin, Zhou, & Kershaw, 2014).

*Remarriage After Divorce and Health*

The health benefits of remarriage are not as great as those of first marriage (Hughes & Waite, 2009). Remarried people are more likely to suffer from chronic diseases and restricted activities than those who marry for the first time, while there is no statistically significant difference in their level of depression (Waite, 2009). But some other researchers have found that
remarried people are more depressed and anxious than first-time marriages (Barrett, 2000). The remarried nevertheless still reap the emotional benefits from their subsequent marriage, remarriage provides emotional security by establishing new attachment relationships (Diamond et al., 2017).

Some research indicated that, compared with remaining divorced, remarriage after divorce is good for health, and remarried people reported fewer depressive symptoms (Williams, 2003; Blekesaune, 2008) and better self-rated health (Williams & Umberson, 2004). Remarriage is associated with a reduction in the risk of developing the chronic obstructive pulmonary disease (COPD), even after controlling for smoking habits (Noda et al., 2009). But some other studies indicated that remarriage after divorce was not associated with health status (Burks et al., 1988; Joung et al., 1998). Remarriage after divorce is not associated with a reduced risk of depression identified by pharmaceutical treatment, compared with remaining divorced (Hiyoshi et al., 2015). The transition from unmarried status (including widowhood and divorce) to a married status appears to have little effect on health (Umberson, 1992).

Compared with people who were never married, remarried people had poorer self-rated health and higher incidence of chronic disease and activity restriction (Hughes & Waite, 2009). Zhang & Hayward (2006) found that the risk of death from cardiovascular or other causes were lower for remarried women than for divorced women.

**Gender Difference**

There is gender difference in the health benefits of marriage. Some researchers found a stronger protective effect of marriage for men than for women (Williams & Umberson, 2004; Liu & Umberson, 2008). Gove (1972) argued that marriage is good for men’s mental health, but not for women’s mental health. Ganong & Coleman (1991) examined the health difference between remarried men and women and found that, although remarried women complained more about their health than remarried men did, there was no significant health difference between remarried men and women. Some recent studies have shown that remarriage is beneficial for the mental health of men relative to being unmarried after any type of disruption (Hammersmith, 2018).

**The Context of Divorce and Remarriage in China**

Influenced by the traditional culture of filial piety, universal marriage is one of the important characteristics of marital behavior in traditional Chinese society. At the same time, under the influence of the traditional family ideology in the patriarchal society, the incidence of divorce and remarriage is very low (Yu,
Even in the 21st century, marriage is still almost universal, divorce remains relatively uncommon in China (Liu et al., 2013). In recent years, with the open attitude toward marriage, the improvement in the status of women and the change in legal regulations, the divorce rate in China has increased (Yu, Zhao & Xie, 2020).

The divorce rate in China has been steadily increasing, with the crude divorce rate rising from 2.1 per 1,000 in 2003 to 3.4 per 1,000 in 2018 (crude divorce rate = the number of divorces/the average population in that year × 1000‰)1. The number of remarriages has also increased. According to the data released by the Ministry of Civil Affairs, China registered 782,000 remarriages in 1990, accounting for only 4.3% of the total number of marriages in that year. In 2018, the number of remarriages registered in China was 4.292 million, accounting for about 1/4 of the total number of marriages registered in that year. Although the attitude of public opinion towards remarriage is becoming increasingly tolerant, the proportion of people who remarry is still relatively low. According to the annual one per thousand population change sample survey in 2005–2019 conducted by the National Bureau of Statistics as indicated in Figure 1, the proportion of widowed and divorced people is about 7% (Number of divorces and widows over the age of 15 in that year/Number of people aged 15 and above in that year), while the highest proportion of remarried widows and divorcees is less than 2% (Number of remarriages aged 15 and above in that year/Number of people aged 15 and above in that year). The proportion of the widowed and divorced population in the survey population is larger than that of the remarried population in the same period.

Figure 1. The proportion of widowed, divorced and remarriage, 2005–2017. Source: website of the National Bureau of Statistics. http://data.stats.gov.cn/easyquery.htm?cn=C01. Note. 2015–2017 sample data on remarriage data not announced.
Present Study

According to the above review, we found that previous research does not take endogenous issues into account, which may have resulted in different findings about the relationship between remarriage and health. And most of the research about the relationship between remarriage and health does not strictly distinguish between remarriage after widowhood and remarriage after divorce, which may introduce heterogeneity issue (Hiyoshi et al., 2015). In particular, there are few studies on remarriage and health in China. As a result, the following two questions will be addressed in this paper: 1) Whether remarriage after divorce has a protective effect on health among those who have experienced divorce. 2) Whether there is gender difference in the health effect of remarriage after divorce.

Methods

Data

The data used in this article are from the National Survey of the China Health and Retirement Longitudinal Study (CHARLS) conducted from 2011 to 2012. In this survey, a stratified (by per capita GDP of urban districts and rural counties), multistage (county/district, village/community, household), PPS (probability proportionate to size sampling) and random sampling strategy was adopted. The sample contains 450 villages/residents’ committees in 150 counties and districts throughout the country. As many as 17,708 people from 10,257 households containing at least one person aged 45 or above responded to the questionnaire, with a response rate of 80.51%. The questionnaire consists of eight parts, from which the information about family members, health status, personal income and household are included in our analysis.

As this article focuses on middle-aged and elderly people with a history of divorce, only 147 individuals remained divorced in this data. China has a universal marriage system due to the influence of the traditional ideology of “carry on the family line”. People born before the 1960s have a more conservative view of marriage, and divorce is uncommon (Yu, Zhao & Xie, 2020). We included those over the age of 45 who had been married twice, now had a spouse, and ended their first marriage due to divorce. Finally, 235 divorcees were chosen, 109 of whom remarried after divorce and 126 remained divorced.

Instrumental Variable Method

Cross-sectional data analysis suggests that remarriage and health may have a mutually causal relationship: one’s health will affect his/her choice to remarry, and remarriage will, in turn, affect his/her health. Perhaps there are omitted
variables in our model; which often lead to endogeneity. If the traditional OLS regression is used, the regression estimation will be biased. We therefore use the instrumental variable method to solve the endogeneity.

In this paper, remarriage after divorce is the endogenous variable. To improve the estimation, the instrumental variable \( Z \) must be introduced. \( Z \) must satisfy two conditions: correlation (the instrumental variable is highly correlated with the endogenous variable) and exogeneity (the instrumental variable is uncorrelated with the error term). The instrumental variable probability model is completed in two stages. The first stage is the regression between the instrumental variable \( Z \) and the endogenous variable \( S \)

\[
S_i = \gamma_0 + \gamma_1 Z_i + \gamma_2 X_i + \varepsilon
\]  

(1)

The second stage is the regression between the interpreted variable \( Y^* \) and the fitted values \( \hat{S}_i \) of the first-stage regression

\[
Y_i^* = \beta_0 + \beta_1 S_i + \beta_2 X_i + \varepsilon_i, \quad Y_i = 1\left(Y_i^* > 0\right)
\]  

(2)

Equation (1) is regressed in the first stage, and then the fitted value \( \hat{S}_i = \hat{\gamma}_0 + \hat{\gamma}_1 Z_i + \hat{\gamma}_2 X_i \) of \( S \) is obtained. In the second stage, the \( S_i \) in Equation (2) is replaced by \( \hat{S}_i \) and obtains an unbiased estimator.

Before building the model, we first use Hausmann test to prove the endogeneity of the remarriage variable, and then use the instrumental variable method to solve the endogeneity. We used Newey two-step estimator, 2SLS model continuous dependent variables, and IV-probit model for dichotomous dependent variables.

In order to improve the bias of small sample data on the estimation, we used bootstrap method to estimate the approximate value of parameters.

**Dependent Variables**

**Depression.** Depressive symptoms were assessed using the 10-item Center for Epidemiologic Studies Depression Scale (CES-D) short form. For Chinese middle- and older-aged people, the CES-D 10 has been found to have good validity and reliability (Cheng & Chan, 2005). The scale includes a total of 10 items relating to the respondent’s feelings and behavior during the last week: “I was bothered by things that don’t usually bother me,” “I had trouble keeping my mind on what I was doing,” “I felt depressed,” “I felt everything I did was an effort,” “I felt hopeful about the future,” “I felt fearful,” “My sleep was restless,” “I was happy,” “I felt lonely,” and “I could not get going.” Each question offers four options: rarely or none of the time (<1 day); some or a little of the time (1–2 days); occasionally or a moderate amount of the time (3–4 days); and most or all of the time (5–7 days). For negative problems, the four options are recorded as 0, 1, 2,
and 3 points, respectively. For positive questions scored in reverse, they are recorded as 3, 2, 1, and 0 points. The total score ranges between 0 and 30 points, with a higher score representing a greater degree of depression. Cronbach’s $\alpha$, which reached 0.805, confirmed its high level of reliability and validity.

**Self-Rated Health.** This was measured by the question: “How would you rate your health status?” There are five possible answers to this question: very good, good, fair, poor, and very poor. The question was asked twice, first summary self-rated health question at the beginning and second at the end of the health survey. We used the second summary self-rated health question, because people respond to a number of specific questions on various elements of their health state after the first summary self-assessed health question. These in-depth questions are prompt contemplation, which leads to improved answers to the second self-assessed health question (Crossley & Kennedy, 2002). The SRH variable is treated as a binary variable, with very good and good set to 0, and fair, poor and very poor set to 1.

**ADL Functional Status.** ADL functional status is an index that indicates the individual functional status of middle-aged and old people when they deal with activities of daily living (ADL) on their own. According to the international standard of Katz’s ADL index, ADL functional status contains six indices: the functional statuses of eating, dressing, transferring, bathing, using the toilet, and continence. In this article, respondents who have no difficulties in all six activities are classified as “ADL active,” while the others are regarded as “ADL impaired.” ADL impaired respondents were assigned the number 1, and ADL active respondents were assigned 0.

**Independent Variable**

The variable “Remarriage after Divorce” was obtained based on two questions: “What is your current marital status?”—which included six items: married with spouse present, or married but not living with spouse temporarily for reasons such as work, separation, divorce, widowed or never married; and “Why did your first marriage end?” to which there were two possible options: death of the spouse or divorce. We combined the data for these two questions. Those who were currently married but whose first marriage ended in divorce were classified as “remarriage after divorce.” These respondents were assigned a value of 1, while those who had not remarried were set to 0.

**Control Variables**

In this paper, we control for variables such as past life habits, characteristics of adolescence, social support and demographic characteristics.
Past life habits include whether the respondent ever smoked or drank, and whether they participated in social activities.

Characteristics of adolescence include the respondent’s residence type before age 16 (0 = village, 1 = city/town) and health condition before age 15 (0 = good, 1 = fair or bad). Demographic characteristics include age, education, personal income, whether the respondent is an agricultural worker, their household registration type (rural or urban), and the region in which they live (Eastern, Central, and Western China).

Social support is measured by whether the respondent is or is not living with one of their children, and the number of their children.

**Instrumental Variables**

There are two instrumental variables: whether there were minor children at the time of the divorce, and the respondent’s age at the time of the divorce. A valid instrumental variable must satisfy two conditions: correlation and exogeneity. The first condition pertains to the instrumental correlation; whether there were minor children at the time of the divorce is related to remarriage. For a single mother after a divorce, the high cost of raising a child will accelerate the act of remarriage (Kuan, 2015). Divorced mothers are at a disadvantage in the marriage market and are less likely to remarry (Beck et al., 1977). There is a relationship between a person’s age at the time of divorce and remarriage. Childless women under the age of 25 at the time of divorce are more likely to remarry (Lampard & Peggs, 1999). According to the 2000 census in China, Shi (2005) found that the remarriage rate was highest among people aged 30–44. In other words, the younger a person is at the time of their divorce, the easier it is for them to remarry. The other condition is exogeneity. Whether there are minor children at the time of the divorce and the respondent’s age at the time of the divorce is not directly related to the health of middle-aged people. In particular, there was no direct relationship between age at the time of divorce, the presence or absence of minors at the time of divorce, and the current health of those who divorced at an early age. In the following empirical results, the two instrumental variables are tested, respectively.

**Results**

**Descriptive Statistics Results**

As shown in Table 1, among the 235 middle-aged and elderly respondents with a history of divorce, 46% remarried, 75% of them thought their SRH was fair or bad, 15% of them suffered from ADL impairment and the scale score for depression averaged 9.33 (SD=7.1). The average level of depression among middle-aged and elderly adults who have been divorced is lower. From
a social and cultural perspective, China’s middle-aged and elderly rarely expressed sadness because it is considered embarrassing and an indication of character weakness (Lee et al., 2007). As a result, the culturally stoic Chinese are more ready to bear bodily maladies, such as heart pain or insomnia, than emotional problems. (Wang & Zhao, 2013).

**Table 1. Definition and Descriptive Statistics of Variables.**

| Variables                          | Definition and Measurement | Mean% | Std. Dev. |
|-----------------------------------|----------------------------|-------|-----------|
| The score of depression           | 0–30                       | 9.33  | 7.08      |
| Self-rated health                 | 0 = good, 1 = fair or bad  | 75%   | —         |
| ADL                               | 0 = ADL active 1 = ADL impaired | 15%   | —         |
| Marital status                    | 0 = divorced 1 = remarried | 46%   | —         |
| Minor children in divorce         | 0 = no 1 = yes             | 60%   | —         |
| Age at divorce                    | 17–65                      | 35.98 | 10.20     |
| Life habits                       |                            |       |           |
| Drinking                          | 0 = no 1 = yes             | 41%   | —         |
| Smoking                           | 0 = no 1 = yes             | 48%   | —         |
| Participate in social activities  | 0 = no 1 = yes             | 55%   | —         |
| Characteristics in adolescence    |                            |       |           |
| Residence before 16 years old     | 0 = village 1 = city/town  | 30%   | —         |
| Health during childhood up to and including 15 | 0 = good 1 = fair and poor health | 29%   | —         |
| Social support                    |                            |       |           |
| Living with child                 | 0 = no 1 = yes             | 52%   | —         |
| Number of children                | 0–10                       | 2.22  | 1.53      |
| Demographic variables             |                            |       |           |
| Gender                            | 0 = male 1 = female        | 40%   | —         |
| Household registration type       | 0 = rural 1 = urban        | 43%   | —         |
| Age                               | 45–87                      | 57.55 | 9.87      |
| Education                         |                            |       |           |
| 0 = illiterate                    |                            | 12%   | —         |
| 1 = primary school                |                            | 39%   | —         |
| 2 = junior middle school          |                            | 26%   | —         |
| 3 = senior high school or above   |                            | 23%   | —         |
| Work                              |                            |       |           |
| 0 = other 1 = Engaged in agricultural work |                    | 37%   | —         |
| Region                            |                            |       |           |
| 0 = Eastern region                |                            | —     | —         |
| 1 = Central region                |                            | 36%   | —         |
| 2 = Western region                |                            | 33%   | —         |
| Personal income (ln+1)            | 0–11.61                    | 4.29  | 4.69      |
Table 2 shows a series of correlations between instrumental variables and remarriage after divorce. At the time of divorce, 60% of people had minor children, and the average age of divorce was about 36. The average age of divorce was 30 for those who remarried, and 40 for those who did not. The younger the divorcee, the easier it is for them to remarry. Among divorcees with minor children, 40.14% remarried and 59.86% remained divorced. This indicates that the presence of minor children affects the divorcees’ re-entrance into the marriage market.

**Regression Results**

Table 3 presents the regression results of the relationship between remarriage after divorce and the degree of depression. Model 1 is the multiple linear regression, and the results show that there is no statistically significant relationship between remarriage after divorce and degree of depression. Considering the causal relationship between remarriage and health, as well as factors such as missing variables in the measurement, the remarriage variables may be endogenous and the instrumental variables may be introduced. Model 2 uses 2SLS regression. In this model, the results of Durbin-Wu-Hausman test for endogeneity support the validity of the instruments used. The $p$-value less than 0.05 in the under-identification test indicates no under-identification. In the weak identification test, Cragg–Donald Wald F statistic is 39.99, well above the value of 19.93 under 10% bias, implying that the instrument does not suffer from weak-IV problem. In the over-identification test, the Sargan statistic is 1.76, and the $p$-value is greater than 0.05, there is over-identification, indicating the instrumental variables are valid. It is necessary to use the results of the instrumental variable method. The results of 2SLS show that the people who remarried after divorce had lower degrees of depression than middle-aged and elderly people who did not remarry.

Table 4 presents the regression for the effect of remarriage after divorced on depression by gender. Model 2 and Model 4 are the 2SLS regression for men with divorce experience and for women with divorce experience, respectively. For men, there is a significant statistical correlation between the degree of depression and remarriage after divorce. Men who remarried after divorce were less depressed than men who did not. For women with divorce

| Table 2. The Relation Between the Instrumental Variable and Independent Variable. |
|---------------------------------|-----------------|-----------------|------|
|                                | Divorced | Remarried | $p$  |
| Age at divorce (mean)          | 40.69    | 30.54     | .000 |
| No minor children n (%)        | 41 (44.09%) | 52 (55.91%) |      |
| Have minor children n (%)      | 85 (59.86%) | 57 (40.14%) | .018 |


Table 3. Regression for Remarried after Divorce on Depression.

|                           | Model 1         | Model 2         |
|---------------------------|-----------------|-----------------|
|                           | OLS             | 2SLS            |
| Remarried                 | -0.50           | -3.89***        |
|                           | (1.14)          | (1.93)          |
| Demographic variables     |                 |                 |
| Household registration type| -0.46           | -0.63           |
|                           | (1.79)          | (1.83)          |
| Age                       | 0.08            | 0.08            |
|                           | (0.06)          | (0.06)          |
| Gender                    | 0.35            | 0.61            |
|                           | (1.27)          | (1.41)          |
| Education                 |                 |                 |
| Primary school            | -1.07           | -0.71           |
|                           | (1.68)          | (1.75)          |
| Junior middle school      | -2.53           | -2.17           |
|                           | (1.94)          | (2.15)          |
| Senior high school and above | -5.01***       | -4.97***        |
|                           | (2.05)          | (2.09)          |
| Work                      | -1.19           | -0.82           |
|                           | (1.32)          | (1.41)          |
| Personal income           | -0.16           | -0.14           |
|                           | (0.10)          | (0.11)          |
| Characteristic in adolescence |             |                 |
| Residence before 16 years old | -1.43           | -1.86           |
|                           | (1.47)          | (1.56)          |
| Health during childhood up to and including 15 | 1.37 | 1.31 |
|                           | (0.96)          | (1.09)          |
| Life habits               |                 |                 |
| Drinking                  | 0.72            | 1.13            |
|                           | (1.06)          | (1.13)          |
| Smoking                   | -1.78*          | -1.88           |
|                           | (1.08)          | (1.20)          |
| Participate in social activities | 0.35 | 0.75 |
|                           | (1.04)          | (1.07)          |
| Social support            |                 |                 |
| Living with child         | -0.53           | -0.38           |
|                           | (0.92)          | (1.10)          |
| Number of children        | -0.36           | -0.10           |
|                           | (0.35)          | (0.40)          |

(continued)
experience, remarriage after divorce is not (statistically) significantly related to the degree of depression.

Table 5 is the regression for people who remarry after divorce on SRH. Model 1 is a probit model; which shows that remarriage after divorce is not statistically significantly related to SRH. Model 2 is an IV-probit model, which indicates that the association between remarriage after divorce and SRH is statistically significant. Compared with middle-aged and elderly people who were divorced, the SRH of people who remarried after divorce was likely to be better. According to Wald test of exogeneity, it is indicated that the explanatory variable (remarriage after divorce) is an endogenous variable, and the instrumental variables are appropriate. We also observe in Table 5 that women’s SRH is worse than men’s; thus, we conducted a regression of the relationship between remarriage and SRH by gender. However, there was no statistically significant correlation between remarriage after divorce and SRH for both men and women, and we omitted the results due to space constraints.

The results of regression for the impact of marriage after divorce on the ADL impaired show that remarriage after divorce is not statistically significantly related to the ADL impaired. So, the regression results are not listed in this paper due to space constraints.
| Table 4. The Regression for Remarried after Divorce on Depression by Gender. |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
|                                | Male Model 1 OLS | Male Model 2 2SLS | Female Model 3 OLS | Female Model 4 2SLS |
| Remarried                      | −1.67 (1.35) | −4.06* (2.34) | 1.67 (2.20) | −0.51 (3.58) |
| Demographic variables          |                |                  |                  |                  |
| Household registration type    | −1.98 (2.09) | −2.17 (1.94) | 2.20 (3.62) | 1.97 (3.73) |
| Age                            | 0.08 (0.08) | 0.09 (0.07) | 0.19* (0.11) | 0.18 (0.12) |
| Education                      |                |                  |                  |                  |
| Primary school                 | 0.74 (2.53) | 0.66 (2.64) | −2.56 (2.74) | −2.18 (2.67) |
| Junior middle school           | −0.38 (2.62) | −0.30 (2.72) | −4.10 (3.70) | −3.71 (3.63) |
| Senior high school and above   | −3.23 (3.01) | −3.31 (2.85) | −6.01 (4.02) | −5.86 (4.20) |
| Work                           | −1.31 (1.67) | −1.08 (1.52) | −1.22 (2.44) | −0.95 (2.62) |
| Personal income                | −0.09 (0.15) | −0.09 (0.16) | −0.27 (0.23) | −0.28 (0.23) |
| Characteristic in adolescence  |                |                  |                  |                  |
| Residence before 16 years old  | −0.88 (2.06) | −0.81 (2.18) | −2.32 (2.85) | −2.88 (2.98) |
| Health during childhood up to and including 15 | 3.05** (1.44) | 2.89* (1.44) | −1.17 (1.66) | −1.07 (1.86) |
| Life habits                    |                |                  |                  |                  |
| Drinking                       | 0.91 (1.23) | 1.36 (1.24) | 1.88 (1.95) | 1.92 (1.99) |
| Smoking                        | −2.77** (1.24) | −2.94** (1.42) | 0.79 (2.30) | 0.85 (2.42) |
| Participate in social activities | 1.03 (1.36) | 1.14 (1.34) | −0.67 (1.61) | −0.28 (1.96) |
| Social support                 |                |                  |                  |                  |
| Living with child              | −1.43 (1.32) | −1.49 (1.36) | (1.61) (0.69) | (1.73) (0.71) |
| Number of children             | −0.49 (0.53) | −0.33 (0.52) | −0.42 (0.69) | −0.22 (0.71) |
| Region                         |                |                  |                  |                  |
| Central region                 | 1.45 (1.92) | 1.67 (2.02) | 0.62 (2.09) | 0.44 (1.97) |

(continued)
Conclusion and Discussion

Marriage is the most important life event, and has a protective effect on health. The dissolution of marriage has a varying degree of influence on emotional, physical, and mental health. From the perspective of remarriage after divorce, this paper analyses the protective effect of marriage on mental health and solves the causal inference, the problem of selection bias and the problem of endogeneity through the instrumental variable method. We found that people who remarried after divorce had a low degree of depression. Remarriage after divorce has a positive effect on men’s mental health, but there is no statistically significant correlation between remarriage and the mental health of women.

We found that, those who remarried after divorce had low degrees of depression. In adulthood, the spouse is considered as the primary attachment figure. However, divorce disrupts the primary affectional bond and might perpetuate feelings of self-doubt and rejection (Brimhall, Wampler & Kimball, 2008). These negative emotional experiences, as well as child-rearing issues, intertwine with each other to increase anxiety and negative emotions of divorced people. Diamond et al. (2017) found that there was no difference in attachment relationship between remarriage and first marriage, and those who remarried after divorce had more attachment security.

Table 4. (continued)

|                  | Male        | Female      |
|------------------|-------------|-------------|
|                  | Model 1     | Model 2     | Model 3     | Model 4     |
| Western region   | 1.89        | 2.42        | −1.90       | −2.33       |
|                  | (1.85)      | (1.78)      | (1.79)      | (1.88)      |
| Constant         | 8.11        | 7.94        | 3.61        | 4.65        |
|                  | (6.34)      | (6.27)      | (7.27)      | (8.41)      |
| Test of endogeneity |             |             |             |             |
| Durbin (score)   | —           | 1.96*       | —           | 0.73        |
| Wu-Hausman       | —           | 1.72*       | —           | 0.59        |
| Under-identification test | — | 45.66*** | — | 27.09**|
| Weak-identification test | | | | |
| Cragg–Donald Wald F statistic | — | 29.28 | — | 15.16 |
| Stock-yogo weak ID test 10% critical value | — | 19.93 | — | 19.93 |
| Over-identification test | — | 0.60 | — | 1.49 |
| N                | 140         | 140         | 95          | 95          |

Bootstrap Standard errors in parentheses; (bootstrap 200).
*p < .1, **p < .05, ***p < .01, ****p < .001.
Table 5. The Regression for Remarried after Divorce on Self-Rated Health.

|                                | Model 1 | Model 2 |
|--------------------------------|---------|---------|
|                                | Probit  | Iv-probit |
| Remarried                      | 0.01    | −0.71*  |
|                                | (0.25)  | (0.41)  |
| Demographic variables          |         |         |
| Household registration type    | 0.01    | −0.17   |
|                                | (0.44)  | (0.46)  |
| Age                            | 0.02    | 0.02    |
|                                | (0.01)  | (0.01)  |
| Gender                         | 0.56*   | 0.59*   |
|                                | (0.33)  | (0.31)  |
| Education                      |         |         |
| Primary school                 | −0.22   | −0.15   |
|                                | (0.42)  | (0.36)  |
| Junior middle school           | −0.51   | −0.45   |
|                                | (0.49)  | (0.44)  |
| Senior high school and above   | −0.67   | −0.68   |
|                                | (0.52)  | (0.48)  |
| Work                           | −0.46   | −0.38   |
|                                | (0.28)  | (0.29)  |
| Personal income                | −0.01   |         |
|                                | (0.03)  |         |
| Characteristic in adolescence  |         |         |
| Residence before 16 years old  | −0.13   | −0.23   |
|                                | (0.44)  | (0.38)  |
| Health during childhood up to and including 15 | 0.46 | 0.44* |
|                                | (0.26)  | (0.24)  |
| Life habits                    |         |         |
| Drinking                       | 0.07    | 0.15    |
|                                | (0.25)  | (0.25)  |
| Smoking                        | 0.09    | 0.06    |
|                                | (0.27)  | (0.28)  |
| Participate in social activities| −0.08   | 0.01    |
|                                | (0.25)  | (0.22)  |
| Social support                 |         |         |
| Living with child              | 0.32    | 0.35    |
|                                | (0.25)  | (0.22)  |
| Number of children             | −0.01   | 0.04    |
|                                | (0.12)  | (0.09)  |
| Region                         |         |         |

(continued)
relationships than those who maintained divorced. Their research implies that remarriage can rebuild an intimate relationship and gain emotional support in marriage. Waite (2009) also found that remarriage can restore the loss of emotion and life, as well as the benefits of marital life. Although remarriage does not provide the same health benefits as first marriage, remarried people still reap some financial, social, and emotional benefits from their remarriage, yielding a healthy advantage relative to the unmarried (Barrett, 2000; Wilmoth & Koso, 2002; Cherlin, 2004). Marriage provides intimate companionship, emotional interaction between husband and wife, mutual help in daily life, satisfaction of the individual’s emotional needs, and the promotion of individual happiness and satisfaction for the middle-aged and elderly people who remarry after divorce, the emotional support of spouses is the main source of emotional support (Ross, 1995; Umberson et al., 1996). This is because people who remarry after divorce are less likely to receive more care from their children than those who have been divorced or widowed (Hu & To, 2017). There were gender differences in the relationship between remarriage and depression after a divorce. Men who remarried after divorce had lower levels of depression than divorced men. Although remarriage after divorce is beneficial to men’s depression, remarriage after divorce has little effect on women’s depression. This is consistent with Hammersmith’s (2018) research findings. The gender difference in mental health is caused by inequalities in gender roles between men and women, according to Gove’s theory of gender role hypothesis. In both the home and society, men have power and authority, whereas women are subordinate (Gove, 1972). This traditional gender division is prevalent in China, where “men are breadwinners and women are housewives” is still the custom in marriage relationships (Chen & Hu, 2021). Men are not required to conduct housekeeping in the home, and they tend to

Table 5. (continued)

|                      | Model 1      | Model 2      |
|----------------------|--------------|--------------|
|                      | Probit       | Iv-probit    |
| Central region       | 0.01         | 0.07         |
|                      | (0.28)       | (0.31)       |
| Western region       | 0.23         | 0.28         |
|                      | (0.29)       | (0.27)       |
| Wald chi2            | 19.73        | 33.49**      |
| Wald test of exogeneity | 4.31**      |              |
| Constant             | –0.11        | –0.09        |
|                      | (1.13)       | (1.01)       |

Bootstrap Standard errors in parentheses; (bootstrap 200).
*p < .1, **p < .05, ***p < .01, ****p < .001.
receive daily care from their wife, are supervised by their wife in terms of family health management (Duncan, Wilkerson, & England, 2006). Marriage delivers more benefits to males in the form of a healthy lifestyle, emotional support, and physical comfort, according to the marital resource model (Williams & Umberson, 2004). On the contrary, most women are required to take care of the daily lives of family members (Lennon & Rosenfield, 1994), and women also participate in the labor force, so women’s mental health will worsen faster than men’s as a result of the dual identities of job and family (Wang & Peng, 2017). Remarriage reduces women’s financial burden, but their dual identities of family and work stay unchanged, and they may need to cope with problems with their stepchildren after remarriage. As a result, remarriage has a limited effect on women’s depression levels.

Remarried people, compared with people who remained divorced, had better SRH. this may be due to spouses’ emotional support, which reduces depression and makes them more inclined to a good subjective evaluation. It is also possible that the various resources and support provided by marriage for health evaluation will alleviate the negative effects of divorce and promote SRH of remarried people. Couples share social support networks and social resources as well as the financial burden of the family (Murray, 2000); marriage also increases personal wealth (Hirschl et al., 2003) and reduces the risk of personal exposure to death. At the same time, marriage increases access to health care, with spouses providing each other with health knowledge and monitoring unhealthy behavior such as alcoholism, smoking, substance abuse, etc.

We found no correlation between remarriage and ADL impairment. Although remarriage has a certain protective effect on health, there may be a problem of selection. Unhealthy people are less likely to enter the remarriage market, and healthy people are more likely to remarry (Joutsenniemi et al., 2006). Although remarried people may suffer from being ADL impaired, those who enter remarriage may be in better health, which may offset the relationship between remarriage and ADL impairment.

There are some limitations to our study. First, the small sample size may lack representation to the population of remarriage after divorce. Future research may consider to conduct the special survey of remarriage after divorce. Second, although the use of the instrumental variable partly solves the endogeneity issues, the selection is not well solved because the health variable we used measured the current health condition of the individuals surveyed and their health status at the time of divorce is unknown. We are therefore unable to test whether people who are healthy are more likely to choose to remarry. Third, due to limited data, it was impossible to obtain data on variables such as personality characteristics, marital quality and reasons for divorce. These factors are important and will be further analyzed in future research.
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Notes

1. http://images3.mca.gov.cn/www2017/file/202009/1601261242921.pdf

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