Gender Differences in Depressive Symptoms in China: An Explanatory Model*

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ABSTRACT

On average, women report more depressive symptoms and other forms of psychological distress than men. While this gender gap has been documented in countries around the world, only a handful of studies have attempted to explain why it exists. The present study addresses this weakness in the literature by outlining a series of possible explanations, and then testing them with data on 2,552 older adults in rural and urban China. Findings show that women do indeed experience more depressive symptoms than men in this sample. They also suggest that a considerable proportion of this gender gap is explained by differences in educational attainment, employment status, physical limitations, and needs for assistance during daily life. In addition, the gender gap appears to be smaller in more developed areas of China, suggesting that economic opportunities may play a key role in reducing gender differences in depressive symptoms in China.

KEYWORDS

Depression, Socioeconomic Status, Health, Aging, Development

INTRODUCTION

Women tend to experience more depressive symptoms and other forms of psychological distress than men, and various explanations have been proposed (Goodwin and Gotlib 2004; Kendler et al. 2006a; Taylor 2002). Research from a stress process framework suggests that women are subject to more frequent or intense stressors than men. Consistent with this argument, research shows that women tend to earn less money, suffer from higher levels of stress, and receive fewer benefits from marriage compared with men, all of which may contribute to depressive symptoms (Mirowsky and Ross 2003).

A gender gap in depressive symptoms has been documented in many countries around the world, including both developing and developed nations (Culbertson 1997; Van de Velde et al. 2010; Weissman et al. 1993). However, much of the research on this topic has been conducted in Western nations such as the United States. Considerably less work has been done on individuals in developing countries. To address this weakness, the present study examines gender differences in depressive symptoms among older Chinese adults using data from the Chinese Health and Longitudinal Survey Pilot Survey (CHARLS). China is currently undergoing rapid industrialization and urbanization, and it is important to understand and monitor the mental health consequences of life in this emerging global superpower. Several specific questions motivate the current study: Is there a gender difference in depressive symptoms in contemporary China? Is the magnitude of this difference comparable to other developed and developing nations? If a gender gap does exist, what are the causes? Are the mechanisms that create these differences similar to other nations?

The present study addresses these questions by first reviewing the cross-national literature on this topic. Based on this theoretical and empirical background, several hypotheses

will then be formulated. A description of the data and methods will then be provided. This will be followed by a summary of the findings, and a discussion of their relevance for research on this topic. The study will conclude by offering an agenda for future research. Overall, the findings reported here not only contribute to our understanding of gender differences in depressive symptoms in China, they also shed light on the experiences of women in a rapidly developing nation.

THEORETICAL AND EMPIRICAL BACKGROUND

On average, women report more depressive symptoms than men (Culbertson 1997; Hopcroft and Bradley 2007; Van de Velde et al. 2010; Weissman et al. 1993). This finding has been replicated in many nationally-representative surveys of US adolescents, working-age adults, and older adults. It has also been found in both developing and developed nations. However, relatively little research has focused on gender differences in depressive symptoms among Chinese adults using large-scale surveys. Based on the cross-national literature on depression, our first hypothesis is:

- *H1: Older Chinese women will report more depressive symptoms than older Chinese men, and the magnitude of this gender gap will be comparable to other developed and developing nations.*

Assuming that a gender difference in depressive symptoms does exist among older Chinese adults, it is important to begin understanding why. Relatively few attempts have been made to explain the gender gap in depressive symptoms in any nation, but the literature does suggest a few possibilities. It is well established cross-nationally that married individuals tend have better mental health than individuals (Mirowsky and Ross 2003). This general trend,

however, may primarily be true for men. Wives tend to be a major psychosocial resource for husbands but husbands may to not serve this role to the same extent for their wives (Neff and Karney 2005), and this could be one reason why women tend to experience greater depressive symptoms. In addition, women in developing nations like China may be financially dependent upon their husbands. Those who are not married may suffer from financial hardship and other forms of stress, and this may increase depressive symptoms. Based on this insight:

- *H2: The gender gap in depressive symptoms will be reduced when marital status is held constant.*

Employment is a key contributor to good mental health, in part because it reduces financial hardship and the stress that accompanies it. Employment also tends to enhance social integration and promote the formation of social support networks than can be used in times of need, and both anticipated and actual levels of social support are associated with psychological well-being (Dean et al. 1990; Turner 1981). There is even evidence that employment is associated with improved mental health among women (Kessler and McRae 1982). In China, where many women still do not work outside of the home, unemployment could contribute to depressive symptoms. Therefore:

- *H3: The gender gap in depressive symptoms will be reduced when employment status is held constant.*

Other aspects of socioeconomic status may also play a role. Until recently, women in both developed and developing nations obtained lower levels of education and income compared with men. While educational disparities have largely disappeared in developed nations such as the United States, they still persist in the developing world. Education is an important determinant of mental health for several reasons. As Mirowsky and Ross (2003) have

emphasized, education is a key to one's position in the stratification system. Educational attainment shapes access to occupational niches, and influences the way work is rewarded in the labor market. Because many persons, particularly the older adults in the CHARLS sample, have completed formal education by age 25-30, education may have cumulative effects on other dimensions of SES, and on individual well-being more generally. Educational attainment is inversely associated with depressive symptoms in part because it facilitates financial security, enhances one's sense of control over their own life, and facilitates effective coping strategies in the face of life's stress. We know that there is a large gender gap in educational attainment in China. Therefore:

- *H4: The gender gap in depressive symptoms will be reduced when education is held constant.*

In both developing and developed nations (including China), women are responsible for most of the family caregiving responsibilities. We know that caregiving is stressful, and has been linked with higher levels of depression. Caregiving stresses may also differentiate women and men. We know that women are more involved in taking care of children, elderly relatives, and even friends than men, and that caregiving roles are stressful (Pinquart and Sorensen 2006). In fact, scholars have noted that women routinely work a "second shift" once they get home from their jobs (Craig 2007; Hochschild 1989). Extra burdens at home are almost certainly stressful, and may therefore contribute to the higher levels of depression experienced by women. Therefore:

- *H5: The gender gap in depressive symptoms will be reduced when caregiving responsibilities are held constant.*

The initial goal of the present study was to examine various aspects of mental and physical well-being among older women and men in contemporary China. During the course of this investigation, a robust finding surfaced: physical limitations such as difficulty moving around are much more common among Chinese women compared with men. Similar findings have been reported previously (Zhang et al. 2005), but we do not currently know exactly why this gender difference exists. A less nutritious diet among women is one possible explanation (Zhang 2006), but this seems like a partial explanation at best, and we are working on a detailed study on this topic. This finding is important for the purposes of the present study because physical limitations have been shown to be strong predictors of depression. Based on this insight, it is hypothesized that:

- *H6: The gender gap in depressive symptoms will be reduced when physical limitations are held constant.*

Differences in economic development across geographic regions have been shown to have profound implications for mental health across many different nations, including China. For example, a recent study found that levels of psychological distress were lower in the more marketized (i.e., developed) areas of China (Yu 2008). The CHARLS data is well-suited to addressing this issue because it contains samples of two different provinces in China: Zhejiang province is more rural and less developed than Gansu province. If levels of economic development are associated with mental health, it is possible that the gender gap in depressive symptoms is lower in the more economically developed areas of China that provide women with greater opportunities for employment and a higher standard of living. Thus:

- *H7: The gender gap in depressive symptoms will be larger in Zhejiang province compared with Gansu province.*

METHODS

Data

Data from the Chinese Health and Longitudinal Survey Pilot Survey (CHARLS) were used to test the hypotheses outlined above. The CHARLS is modeled after other national older adult surveys such as the U.S. Health and Retirement Survey and English Longitudinal Survey of Aging. CHARLS is a representative sample of Chinese adults over the age of 45, who live in Gansu and Zhejiang provinces. Respondents were chosen using a four-tier stratification system: province-level, county-level, neighborhood-level and household-level. Data were collected in 2007 in two Chinese provinces: Gansu and Zhejiang province. Minority Tibetan counties in Gansu province were omitted because of cultural and political barriers. These provinces were chosen to represent China's economic diversity. Zhejiang, located on China's East coast, is one of the most successful regional economies, after Beijing and Shanghai. Gansu is located in Northwest China and in 2007 was China's poorest province (Zhao 2009). At the time of the survey, annual per capita income in urban Zhejiang province was $2,743, compared to $1,334 in urban Gansu province (China Data Online 2012). Rural households fared much worse. Annual per capita income was $652 in rural Zhejiang province and $376 in rural Gansu province (China Data Online 2012)

The CHARLS data was collected using a four-stage stratified sample. Within each province, counties were stratified as urban or rural. 16 counties were randomly selected from each province. Three neighborhoods (urban) or villages (rural) were then randomly selected from each county. Households were then randomly selected from each neighborhood, and all individuals in the household were screened to determine whether they were eligible to take the

survey. Therefore, the CHARLS is a representative sample of individuals over the age of 45, living in Gansu and Zhejiang provinces.

The CHARLS asks a variety of questions at the individual, household, and community level on health, socioeconomic status, and social/family support. The CHARLS is ideal for this study because of the combination of detailed socioeconomic and health items included in the survey. The CHARLS collected observations on 2,685 individuals from 1,570 households. Observations missing individual and household identification numbers were omitted. Respondents under the survey's target age of 45 were also omitted.[1] Multiple imputation was used for all other missing data (Acock 2005). The final sample contains 2,552 individuals.

In the sample, 51% is female, and the mean age of the sample is 59 years old. A vast majority of the sample is married (83 %), and most are employed in agriculture (81 %). The average household consists of a little less than 5 people (4.67). 53 % of the respondents live in Zhejiang province, and 81 percent have rural *hukou* status. The median wealth owned by each household is $5,384 (U.S. Dollars). Since many of these adults do not receive pensions or social security, this wealth represents their entire life savings.

Measures

Dependent Variable

Depression is a psychological condition defined by negative emotions and malaise (Ross 2000). We measure depressive symptoms as a continuous variable, operationalized by a series of nine questions based on metrics in widely-used surveys such as the Health and Retirement Survey and National Longitudinal Study of Adolescent Health. Respondents were asked how often in the last

[1] Six individuals were younger than 45.

week they "1) were bothered by things that don't usually bother them, 2) had trouble keeping their mind on what they were doing, 3) felt depressed, 4) slept restlessly, 5) were happy, 6) felt lonely, 7) could not get going, 8) felt everything they did was an effort, and 9) felt fearful" (Zhao 2009). The responses were given on a four-point scale ranging from 1="rarely or none of the time (less than 1 day)" to 4= "most or all of time (5-7 days)". Items which measured happiness were reverse coded, and then all responses were summed (Cronbach's α=0.83).

Independent Variables

The goal of this research is to identify the reason for gender differences in depression; therefore the key independent variable is gender. We measure gender as a dichotomous variable with male as the reference category (female=1).

We also operationalize other key variables which previous research has shown influence depression and that might explain the gender gap in depressive symptoms. Marital status is operationalized using a series of dichotomous variables, indicating whether a respondent is married (reference), single, divorced/separated, or widowed.

Respondent's employment status is measured using a series of four variables: agricultural worker (reference), employed, laid-off, and home maker.

We measure education using a set of five dummy variables. The five categories of educational attainment are no education, some education without graduating from elementary school, elementary school, middle school, and having attained any education greater than middle school. Educational attainment greater than middle school is the reference category.

Giving and receiving care are both operationalized as dichotomous variables (Giving care=1 and not giving care=0; receiving care=1 and not receiving care=0). The CHARLS defines

care as being given to a parent, grandchild, or acquaintance, and can consist of household chores, feeding, and dressing, as long as these duties are voluntary and are not monetarily compensated.

Physical limitations is measured as a continuous variable by combining nine questions about the respondent's ability to walk, stand, and carry weights. Respondents were asked whether they have any difficulty "1) running or jogging about 1 km, 2) walking 1 km, 3) walking 100 meters, 4) getting up from a chair after sitting for a long period of time, 5) climbing flights of stairs without resting, 6) stooping, kneeling or crouching, 7) reaching or extending your arms above shoulder level, 8) lifting or carrying weights of 10 *jin*, like a heavy bag of groceries, or 9) picking up a small coin from a table"(Zhao 2009). The responses were given in the form of a 3 point scale, in which 1= "no, I don't have any difficulties", 2= "Yes, I have difficulty", and 3= "I cannot do it". These responses were summed to create a scale (α=0.84). This scale's lowest possible score is 9 points (very agile) and highest possible score is 36 points (very restricted movement).

We also fit all of our models separately for each province.

Control Variables

Our multivariate models control for three variables: age, wealth, and hukou status. Age is represented as a continuous variable. Respondent wealth is also operationalized as a continuous variable. Wealth is logged in order to reduce the extreme skew.[2] Wealth is used, as opposed to income, because only 15.7 percent of respondents are employed outside of agricultural, and

[2] Following Schneider (2011), I add one to the entire sample. Then, I separated those with negative wealth from the rest of the sample, multiplied the negative wealth values by -1, logged the wealth values, and multiplied the values by -1 again. I then logged the positive wealth values, and combined the negative and positive logged wealth values. The skewness of wealth is 31.57, compared to the skewness of logged wealth, which is -2.47.

therefore, household incomes in this sample are low.[3] Wealth was calculated by subtracting the value of respondents' total debt from the value of their total assets. Respondent assets are comprised of financial assets, such as stocks, bonds, and saving accounts, and real assets, such as home value, vehicle, and motorcycle value. Rural *hukou* status is represented by a dichotomous variable, with urban *hukou* status as the reference category.

Analytic Strategy

Because our dependent variable is continuous and normally distributed, we use ordinary least squares regression in all of our models. We run separate models by province, although similar patterns are found when models include both provinces. We also tried using multi-level models allowing for independent intercepts and slopes for each neighborhood, in order to determine whether differences in depressive symptoms are due to neighborhood level factors. However, when province was held constant, neighborhood level variables were no longer significant, indicating that differences in depressive symptoms are due to individual and province-level factors.

[Table 1 Here]

RESULTS

Table 1 shows descriptive statistics by gender in Gansu province. We use chi-square and t-tests to determine whether there are significant differences in key dependent and independent variables. Most notably, females in Gansu province report more depressive symptoms than males, with a mean score of 19.43 on the depression scale, compared to a mean score of 17.57

[3] Results did not differ significantly when household income was used in place of household wealth.

for males. Chi-square tests indicate that there are many significant differences by gender in Gansu province which may contribute to a higher number of females reporting depressive symptoms. First, females have much less education than males, with 69.6% of women having no education, compared to 29.2% of men. Significantly more females (20.1%) than males (11.6%) are widows. Females also receive more care from relatives and friends (60.7%) than males (46.5%). Finally, females in Gansu province report on average more symptoms of physical limitations (10.16) than males (9.15). In contrast, a significantly higher proportion of males than females in Gansu province are married (85.7 % compared to 79.6%), working in agriculture (65.6% compared to 55.8%), employed (8.3% compared to 3.7), and received higher education (15.6% compared to 6.4%). These disparities in marital status, employment, education, care and physical limitations all may contribute to females reporting more depressive symptoms than men in Gansu province.

[Table 2 Here]

Table 2 shows descriptive characteristics by gender in Zhejiang province. Again, we use chi-square tests and t-tests to determine whether the differences are significant. While on average females in Zhejiang province report more depressive symptoms (15.7) than males (15.1), the difference is not as large as in Gansu province. Similar to Gansu province, more women are widowed (17.4%), home makers (5.0%), uneducated (52.9%), recipients of care (26.4%), and have physical limitations (8.49) than men. A greater percentage of males are married (86.6%), employed (25.3%), work in agriculture (48.9%), and have higher education (9.9%). Tables 1 and 2 provide initial empirical evidence that women report more depressive symptoms than men in rural and urban China. They also indicate that disparities in marital status, employment,

education, care giving status, and physical limitations may contribute to this gender difference in depressive symptoms in both Zhejiang and Gansu provinces.

[Table 3 Here]

Table 3 shows the bivariate correlations between depressive symptoms and key independent variables. Reported depressive symptoms are strongly and positively correlated with reported difficulty moving (r= 0.37) and receiving care (r= 0.23). Depressive symptoms are more weakly correlated with being female than it is with having physical limitations and receiving care, but the relationship is still significant (r= 0.11). Depressive symptoms are negatively correlated with marriage (r= -0.136), employment (r= -0.13), and higher education (r= -0.11). Interestingly, giving care is the only variable not significantly correlated with depressive symptoms. All other associations with depressive symptom are statistically significant at $p < 0.0001$. Furthermore, giving care only has statistically significant associations with employed (r= -0.07) and difficulty moving (r= -0.18). All other associations between independent variables are statistically significant at $p < 0.0001$. These correlations provide preliminary support for our seven hypotheses.

[Table 4 Here]

In Table 4, the results of an ordinary least squares regression analysis of depressive symptoms on demographic characteristics are presented. Models in Table 4 include only respondents living in Gansu province. Model 1 shows the relationship between gender and depressive symptoms when only age, wealth (logged) and *hukou* status are held constant. As hypothesized, being female is associated with a significant 1.79 point increase (on a scale from 9 to 36) of reported depressive symptoms. Model 2 tests Hypothesis 2 by adding marital status to the first model. Being single, divorced, or widowed increases depressive symptoms compared to

being married. As hypothesized, holding marital status constant decreases the gender gap in depressive symptoms of those living in Gansu province, although only slightly (1.9%). Model 3 tests hypothesis 3 by controlling for employment status. Employment status is not significantly associated with depressive symptoms. Model 3 fails to support Hypothesis 3, because controlling for employment status increases the gender gap in depressive symptoms. Specifically, when employment status is added, being female is associated with a 3.0% increase of depressive symptoms.

Model 4 tests Hypothesis 4 by holding educational attainment constant. Having no or some education is associated with an increase in depressive symptoms. Model 4 supports Hypothesis 4; when education is held constant the gender gap decreases by 54.1%. This decrease is much greater than when marital status is held constant. Model 5 tests Hypothesis 5 by controlling for care giving status. There is no significant relationship between giving care and depressive symptoms. However, receiving care is associated with an increase in depressive symptoms. Model 5 supports Hypothesis 5, although holding care giving status constant does not decrease the gender gap as much as holding education constant does. Controlling for care giving status decreases the gender gap by 19.6%. Model 6 tests Hypothesis 6 by controlling for physical limitations. Physical limitations are associated with a significant increase in depressive symptoms. While the gender gap remains, controlling for physical limitations decreases the gender gap by 63.8%. Controlling for physical limitations decreases the gender gap more than any of the previous models. This supports Hypothesis 6. The gender gap in depressive symptoms only disappears when marital status, employment, educational attainment, care giving status, and physical limitations are simultaneously held constant (Model 7). When all characteristics are added to the model, the gender gap decreases by 111.9% and is no longer

statistically significant. In Model 7, being single, no or low educational attainment and physical limitations are all associated with an increase in depressive symptoms and are statistically significant at $p < .05$.

[Table 5 Here]

Table 5 shows the results of an ordinary least squares regression analysis of depressive symptoms on demographic, care and mobility characteristics in Zhejiang province. Models are identical to those in Table 4. Model 1 indicates that being female is associated with increased depressive symptoms. However, the gender gap in depressive symptoms is much smaller in Zhejiang than in Gansu province. In Zhejiang province, being female is associated with a 0.648 increase on the depression scale, compared to a 1.79 point increase in Gansu province. Controlling for marital status in Model 2 shows differing patterns in Zhejiang and Gansu province. While holding marital status constant decreased the gender gap in Gansu province models, it increases the gender gap by 10.1% in the Zhejiang province models. Similarly, controlling for employment status in Model 3 decreases the gender difference in depressive symptoms in the Zhejiang models by 11.5 %, while it increased the gender gap in the Gansu models. The gender gap in depressive symptoms is no longer significant when educational attainment is held constant in Model 4. It is also not significant when care giving status (Model 5) and physical limitations (Model 6) are held constant. Controlling for all characteristics in Model 7 completely eliminates the gender gap in depressive symptoms. Just as in Table 4, being single, having low educational attainment, and reporting physical limitations are associated with an increase in depressive symptoms in Model 7.

DISCUSSION

Increased incidence of female depression is a well-documented phenomenon in the U.S., cross-nationally, and in China (Chen 2005; Hopcroft 2007; Leveque Katia 2010). Medical sociologists have attributed this gender gap to gender inequality in education (Ross 2000), marital status (Gutierrez-Lobos 2000), and employment (Lee 2009; Mirowsky 1996). Recently, scholars have confirmed that an increased incidence of female depressive symptoms exists in China, and can be explained by similar factors as in the U.S.: gender inequality in educational attainment, housing, and social structures (Chen 2005; Lai 2011). However, research on the gender gap in depressive symptoms in China has thus far been limited to a single province. Research on the subject in China has also been restricted to exclusively rural or urban samples. Our findings support previous research on the Chinese gender gap in depression. Uniquely, it also demonstrates that this gender gap varies substantially by province. Moreover, our samples are from provinces with differing levels of marketization, suggesting that economic development decreases the gender gap in depression among elderly Chinese.

Our research reveals striking similarities in the effect of gender on mental health in Gansu and Zhejiang provinces. In both provinces, females reported having a significantly greater number of depressive symptoms. Other individual characteristics, such as being single, having no education, receiving care, and reporting having physical limitations were also associated with an increased number of depressive symptoms in both provinces. Being a homemaker was associated with increased depressive symptoms in Zhejiang, but not Gansu province. In both Gansu and Zhejiang province, gender was an indirect factor affecting depressive symptoms, and was no longer associated with a significant increase in depression once all other contributing factors were held constant. However, in Zhejiang province, education, care giving status, and physical limitations all explained the gender gap in depressive symptoms *independently*.

Interestingly, the gender gap of the Gansu sample was only explained by simultaneously controlling for all of these variables, in addition to marital status, employment, age, wealth, and hukou status. This indicates that while in Zhejiang the gender gap in depression is explained by inequity in specific socio-economic, health, and demographic factors, the gender gap in Gansu province is the cumulative effect of gender inequality.

Our research also revealed that the gender gap in depression is much greater in Gansu than Zhejiang province. In fact, the difference in depressive symptoms between males and females in Gansu province is almost three times greater than in Zhejiang province when rural hukou and wealth were held constant. This suggests that the gender gap in depression is lower in Chinese provinces with high levels of marketization and development. Development brings many social benefits, which in turn improve individual living standards. Interestingly, women in Zhejiang province report less depressive symptoms than do men in Gansu province, making the gap between Zhejiang and Gansu women's depressive symptoms larger than the gender gap in depressive symptoms in Gansu province. This supports previous research that individuals living in marketized regions of China have better mental health than those living in more impoverished regions (Yu 2008). It also suggests that provincial economic development is a more powerful predictor of mental health than gender in China. One explanation for this may be that living in marketized regions provides optimism about the future even if one's current financial reality is not ideal. For example, Zhejiang has experienced phenomenal growth in income and number of private enterprises, both of which may increase resident confidence in the local market, and subsequently their life chances. Conversely, poverty has persisted in Gansu province due to lack of economic development, and poverty is highly correlated with depressive symptoms, especially for women (Doucet 2003).

Our study informs research on the relationship between economic development and mental health. Farming as an occupation, food scarcity and quality, limited health and educational facilities, and access to psychotropic medicine have all been found to be mediators in the relationship between development and mental health [for review see (Corrigall 2008)]. Our study shows that characteristics of development not only affect mental health, but are also important in determining the degree to which men and women are differentially affected by them. Our study has several important implications for scholarship on gender and market transition. Similar to Hannum (2005), our results provide support for both the Women in Development (WID) and modernization theories. WID theory hypothesizes that gender equality will worsen at the beginning of economic development (Boserup 1989 [1970]; Hannum 2005). We found that increased incidence of depressive symptoms in Chinese provinces is due to educational and occupational disparities, which supports the WID theory. Modernization theory postulates that gender equality will accompany economic development (Treiman 1970). Our research found a much smaller gender gap in depression in Zhejiang province, which is much more developed, thus supporting the modernization theory.

While our research demonstrates that the gender gap in China varies by provincial development, future research would benefit from further investigating the relationship between depression and marketization. Establishing cause and effect between depression and other demographic characteristics in China is one topic which mental health scholars could further explore. This is especially important when determining whether care-giving status and physical limitations explain increased incidence of female depression. For instance, having limited physical mobility may increase female depressive symptoms, or increased rates of depression may explain greater physical limitations among females. As additional waves of CHARLS are

released, future research should determine the causal order of these symptoms. The CHARLS pilot survey uses representative samples of Gansu and Zhejiang province, which, although facilitating comparisons of the gender gap in between provinces, does not allow for a nation-wide analysis of female depression among older adults. Future research should test our hypothesis that provinces with greater economic development have a smaller gender gap using nationally-representative data.

A limitation of this research is that although the CHARLS has a 9 question scale for identifying depressive symptoms, this scale does not provide sufficient information to diagnose clinical depression. Therefore, our research examines the gender gap in depressive symptoms, and not depression itself. However, using depressive symptoms as the dependent variable also has several advantages. First, depressive symptoms identify not only those categorized as clinically depressed, but also those who at risk for becoming depressed or who recently recovered from depression. Depression can be experienced periodically, especially in wake of stressful or traumatic life events. Therefore, the continuum of depressive symptoms is better able to identify those who have, or are at risk of being depressed. As with all research, we were not able to exhaustively rule out certain factors which may contribute to the gender gap. For example, we were not able to test whether a greater incidence of suppressed anger increases the gender gap in depressive symptoms among Chinese elderly, which recent search demonstrates contributes to the greater incidence of female depression (Lively 2010).

In the past several decades, China has transitioned from a socialist to market economy. This transition has enabled incredible economic development, evidenced by the fact that in 2006 China's GDP replaced Japan's as the second largest in the world, and is predicted to surpass the U.S. as the world's largest economy in 2021 (Hatakeyama 2011). However, as a result of

staggered development policies, provincial economies have benefitted differentially from the transition. Economic development has exacerbated inter-province inequality, making coastal provinces the beneficiaries of foreign capital and government-directed urban development, while many outer provinces remain impoverished with little infrastructure and few government resources. This study suggests that disparities in economic development have important health related outcomes, such as the gender gap in depressive symptoms. The decreased gender gap in Zhejiang province suggests an improvement of social conditions for Chinese women living in developed areas.

REFERENCES

Acock, Alan C. . 2005. "Working with Missing Values." Journal of Marriage and Family 67(1012-28).

Boserup, Ester. 1989 [1970]. Woman's Role in Economic Development. London: Earthscan.

Chen, Ruoling. 2005. "Depression in Older People in Rural China." Archives of Internal Medicine 165(17):2019-25.

China Data Online. 2012. "China Data Online: Zhongguo shu ju zai xian." edited by All China Marketing Research: University of Michigan.

Corrigall, Joanne, Sophie Plagerson, Crick Lund, and Johnathan Myers. 2008. "Global Trade and Mental Health." Global Social Policy 8(3):335-58.

Craig, Lyn. 2007. "Is There Really a Second Shift, and If So, Who Does It? A Time-Diary Invesitigation." Feminist Review 86: 149-170.

Dean, Alfred, Bohdan Kolody, and Patricia Wood. 1990. "Effects of Social Support from Various Sources on Depression in Elderly Persons." Journal of Health and Social Behavior 31: 148-161.

Doucet, Deborah B. 2003. "Poverty, Inequality, and Discrimination as Sources of Depressin among U.S. Women." Psychology of Women Quarterly 27(2):101-13.

Gutierrez-Lobos, K., G. Wolfl, M. Scherer, P. Anderer, and B. Schmidl-Mohl. 2000. "The Gender Gap in Depression Reconsidered: The Influence of Marital and Employment Status on the Female/Male Ratio of Treated Incidence Rates." Social Psychiatry and Psychiatric epidemiology 35(5):202-10.

Hannum, Emily. 2005. "Market Transition, Educational Disparities, and Family Strategies in Rural China: New Evidence on Gender Stratification and Development." Demography 42(2):275-99.

Hatakeyama, Noboru. 2011. "China's Rise in GDP Ranking." Japan Spotlight: Economy, Culture & History 30(2):1.

Hochschild, Arlie Russel. 1989. The Second Shift. Penguin Books: New York, NY.

Hopcroft, Rosemary L., Dana Burr Bradley. 2007. "The Sex Difference in Depression across 29 Countries." Social Forces 85(4):1483-507.

Lai, Daniel and Aimei Guo. 2011. "Gender Differences in Depressive Symptoms of Aging Chinese in Urban Jiangsu in China." Clinical Gerontologist 34(3):190-206.

Lee, Jinkook and James P. Smith. 2009. "Work, Retirement, and Depression." Journal of Population Ageing 2(1):57-71.

Leveque Katia, Piet Bracke, and Sarah Van de Velde. 2010. "Gender Differences in Depression in 23 European Countries: Cross-national Variation in the Gender Gap in Depression." Social Sciences & Medicine 71(2):305-13.

Lively, Kathryn, and Robin W. Simon. 2010. "Sex, Anger and Depression." Social Forces 88(4):1543-68.

Mirowsky, John. 1996. "Age and the Gender Gap in Depression." Journal of Health and Social Behavior 37(4):362-80.

Neff, Lisa A., and Benjamin R. Karney. 2005. "Gender Differences in Social Support: A Question of Skill or Responsiveness." Journal of Personality and Social Psychology 88: 79-90.

Pinquart, Martin, and Silvia Sorensen. 2006. "Gender Differences in Caregiver Stressors, Social Resources, and Health: An Updated Meta-Analysis." The Journals of Gerontology: Series B Volume 61: 33-45.

Ross, Catherine E. . 2000. "Neighborhood Disadvantage and Adult Depression." Journal of Health and Social Behavior 41(2):177-87.

Schneider, Daniel. 2011. "Wealth and the Marital Divide." American Journal of Sociology 117(2):627-67.

Treiman, Donald J. 1970. "Industrialization and Social Stratification." in Social Stratificaiton: Research and Theory for the 1970s, edited by E.O. Laumann. Indianapolis, IN: Bobbs-Merrill.

Turner, R. Jay. 1981. "Social Support as a Contingency in Psychological Well-Being." Journal of Health and Social Behavior 22: 357-367.

Yu, Wei-hsin. 2008. "The Psychological Cost of Market Transition: Mental Health Disparities in Reform-Era China." Social Problems 55(3):347-69.

Zhang, Zhenmei. 2006. "Gender Differentials in Cognitive Impairment and Decline of the Oldest Old in China." The Journals of Gerontology: Series B 61: S107-S115.

Zhang, Wenjuan, Shuzhuo Li, and Marcus W. Feldman. 2005. "Gender Differences in Activity of Daily Living of the Elderly in Rural China: Evidence from Chaohu." Journal of Women & Aging 17: 73-89.

Zhao, Yaohui, John Strauss, Albert Park, Yan Shen, Yan Sun. 2009. "China Health and Retirement Longitudinal Study- Pilot Questionnaire." edited by National Institute on Aging and World Bank.

Table 1. Descriptive Statistics by Province (Gansu) and Gender

	Female		Male		
	Mean	*SD*	*Mean*	*SD*	*P-value*
Depression Scale	19.434	5.648	17.583	5.767	***
Age	58.906	9.929	59.784	9.746	ns
Wealth (Lg)	8.002	4.933	8.361	4.424	ns
Rural Hukou	0.818	0.386	0.786	0.41	ns
Married	0.796	0.403	0.857	0.35	**
Single	0	0	0.017	0.128	ns
Separated/Divorced	0.003	0.058	0.01	0.099	ns
Widow	0.201	0.401	0.116	0.321	***
Agricultural Worker	0.558	0.497	0.656	0.475	***
Employed	0.037	0.189	0.083	0.276	***
Laid Off	0.003	0.058	0.007	0.081	ns
Home Maker	0.046	0.209	0.007	0.081	***
No Education	0.696	0.46	0.292	0.455	***
Some Education	0.078	0.268	0.146	0.353	***
Elementary School	0.073	0.259	0.206	0.404	***
Middle School	0.086	0.28	0.198	0.398	***
Higher Education	0.064	0.245	0.156	0.363	***
Gives Care	0.246	0.431	0.241	0.428	ns
Receives Care	0.607	0.488	0.465	0.499	***
Difficulty Moving	10.159	2.595	9.152	2.434	***
N	593		602		

Chi-square and t-tests used to determine significance.

Table 2. Descriptive Statistics by Province (Zhejiang) and Gender

	Female		Male		
	Mean	*SD*	*Mean*	*SD*	*P-value*
Depression Scale	15.664	4.84	15.092	4.675	*
Age	59.294	10.572	60.831	10.415	**
Wealth (Lg)	10.392	4.374	10.589	3.958	ns
Rural Hukou	0.817	0.387	0.800	0.400	ns
Married	0.805	0.396	0.866	0.341	**
Single	0	0	0.031	0.173	***
Separated/Divorced	0.021	0.142	0.021	0.142	ns
Widow	0.174	0.379	0.082	0.275	***
Agricultural Worker	0.341	0.474	0.489	0.500	***
Employed	0.218	0.413	0.253	0.435	ns
Laid Off	0.004	0.066	0.003	0.054	ns
Home Maker	0.050	0.218	0.004	0.066	***
No Education	0.529	0.499	0.233	0.423	***
Some Education	0.201	0.401	0.295	0.456	***
Elementary School	0.136	0.343	0.244	0.430	***
Middle School	0.087	0.282	0.128	0.334	*
Higher Education	0.046	0.209	0.099	0.298	***
Gives Care	0.215	0.411	0.199	0.399	ns
Receives Care	0.264	0.441	0.177	0.381	***
Difficulty Moving	8.489	2.051	7.915	1.740	***
N	678		679		

Chi-square and t-tests used to determine significance.

Table 3. Bivariate Correlations of Depressive Symptoms and Key Independent Variables

	Depression	*Female*	*Married*	*Employed*	*Higher Education*	*Gives Care*	*Receives Care*	*Difficulty Moving*
Depression	1							
Female	.106	1						
Married	-.136	-.081	1					
Employed	-.133	-.055	.064	1				
Higher Education	-.115	-.124	.075	.173	1			
Gives Care	-.006	.013	-.016	-.070	.008	1		
Receives Care	.263	.116	-.091	-.208	-.116	.009	1	
Difficulty Moving	.371	.163	-.213	-.206	-.132	-.018	.554	1

N=2,552

Table 4. Ordinary Least Squares Model of Depression in Gansu Province

	1	2	3	4	5	6	7
Female	1.790***	1.771***	1.821***	1.249***	1.594***	1.088***	0.671
	(0.328)	(0.332)	(0.332)	(0.361)	(0.332)	(0.327)	(0.365)
Single		3.883*					2.643
		(1.798)					(1.751)
Divorced		4.911*					4.233*
		(2.042)					(1.973)
Widow		1.281**					1.138*
		(0.484)					(0.483)
Employed			0.630				1.144
			(0.751)				(0.739)
Laid-off			1.425				1.478
			(2.298)				(2.206)
Home maker			0.035				-0.452
			(1.075)				(1.039)
No Education				2.407***			2.303***
				(0.645)			(0.636)
Some Education				1.658*			1.764*
				(0.740)			(0.725)
Elementary				1.366			1.547*
				(0.673)			(0.665)
Middle School				1.169			1.062
				(0.673)			(0.654)
Gives Care					-0.097		0.012
					(0.392)		(0.384)
Receives Care					1.362***		0.180
					(0.353)		(0.415)
Difficulty Moving						0.661***	0.618***
						(0.074)	(0.086)
Adjusted R							

N=1195. Age, wealth (logged) and hukou status are controlled for but not displayed in all models.

Table 5. Ordinary Least Squares Model of Depression in Zhejiang Province

	1	2	3	4	5	6	7
Female	0.648*	0.749**	0.533*	0.273	0.465	0.242	-0.067
	(0.263)	(0.268)	(0.264)	(0.275)	(0.262)	(0.259)	(0.276)
Single		4.345***					4.209***
		(1.079)					(1.05)
Divorced		-0.028					-0.033
		(0.953)					(0.938)
Widow		0.306					0.045
		(0.483)					(0.466)
Employed			-0.162				0.045
			(0.335)				(0.466)
Laid-off			-2.120				-2.116
			(2.091)				(2.019)
Home maker			2.217**				1.880*
			(0.815)				(0.792)
No Education				1.525*			1.625**
				(0.645)			(0.611)
Some Education				0.441			0.697
				(0.614)			(0.586)
Elementary				0.427			0.631
				(0.598)			(0.577)
Middle School				0.114			0.363
				(0.635)			(0.609)
Gives Care					-0.219		-0.100
					(0.324)		(0.321)
Receives Care					1.765***		0.544
					(0.338)		(0.375)
Difficulty Moving						0.641***	0.564***
						(0.073)	(0.081)
Adjusted R							

N=1,357. Age, wealth (logged) and hukou status are controlled for but not displayed in all models.