

Rodríguez Andrés, Antonio; Hopcroft, Rosemary L.; Noh, Yong-hwan

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Depressive mood and children: Europe and South Korea

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by:

Antonio Rodríguez Andrés
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April 2011

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Depressive mood and children: Europe and South Korea

Antonio Rodríguez Andrés*
Aarhus University

Rosemary L. Hopcroft
University of North Carolina at Charlotte

Yong-Hwan Noh
Seoul Women's University

April 2011

Abstract

Using data for the third wave from the European Social Survey (ESS) and the Fourth Korean National Health and Nutrition Examination Survey (KNHANES), this research examines the relationship between having children at home and depression among men and women aged 18-75 years. Multilevel and probit regression models are applied. Our results show that there is a gender differential in depression. Having children at home improves psychological well-being for men only in 23 European countries and South Korea. In Europe we also find that depression tends to be lower in countries in which per capita income is higher. The results also show that household income is negatively associated with levels of depression in South Korea.

Keywords: Depression; Europe; Cross-national analysis; Children;
Multilevel model, Probit model

JEL classification: I12; 057; Z13; J13

* Corresponding author: Antonio Rodríguez Andrés, Institute of Public Health, Aarhus University, Bartholins Allé 2, 8000 Aarhus C, Denmark. This work was supported by a special research grant from Seoul Women's University (2011).

1. Introduction

Depression is a mental condition marked by changes in mood, sleep, self-attitude, appetite, sexual activity, and energy level. It is the leading cause of chronic disability (Üstün et al., 2004), and is expected to be the number one mental disorder in the developed world by 2020 (WHO, 2001). Depression also strikes women more than men. The prevalence of depression is 1-5 times greater in women than (Kessler et al., 1993; Piccinelli & Wilkinson, 2000; Ayuso et al., 2001; Van de Velde et al., 2010). This gender gap can be explained by genetic, neuro-hormonal, or psychobiological factors (Kuehner, 2003) and also social conditions (Weissman et al., 1996; Hopcroft & Bradley, 2007; Van de Velde et al., 2010). Women are more likely than men to experience financial strains associated with single parenthood, also child care difficulties and role overload in juggling work and family responsibilities (Rosenfield, 1989; Ross et al., 1983; Mirowsky, 1996; Simon & Nath, 2004).

Many of these issues stem from women's greater role in childcare and responsibility for children (Gove & Tudor, 1973; Gove & Geerken, 1977; Wu & DeMaris, 1996; Bebbington, 1996; Glass & Camarigg, 1992). Given this, it might be supposed that the presence of children in the home will have more adverse affects on women's mental health than men's mental health, yet empirical results on this are mixed. There is evidence from the U.S. that the presence of young children under the age of 18 has detrimental affects on mental health (McLanahan & Adams, 1987, 1989; Simon & Nath, 2004; Evenson & Simon, 2005). In the psychological literature, there is empirical evidence that the presence of children has a negative effect on the mental health of parents (e.g., Campbell, 1975; Radloff, 1975). But there is little research specifically on

sex differences in this. But McLanahan and Adams (1987) found no sex difference on the effects of children on feelings of well-being. Simon and Nath (2004) found no evidence that residing with young children is associated with more frequent negative feelings for mothers and fathers. Evenson and Simon (2005) found no sex difference in the relationship between parenthood and depression. Recently, using data from the third round of the European Social Survey (henceforth ESS), Van de Velde et al. (2010) found that having young children aged less than 12 at home did not have any impact on depression, regardless of gender.

Some studies do show that children are more likely to promote depression in women than men. Hopcroft and McLaughlin (2007) found with cross-national data from the World Values Survey (WVS) that total number of children increased depressive mood in high gender equity societies, and this effect was greater for women than for men. Behrman et al.(2005) using Danish data found that the birth of a child increased happiness for married women, but they also found that additional children have a negative effect on subjective well-being (proxied by life satisfaction) for women only.

Yet other studies show the reverse. Nomaguchi and Milkie (2003) found that new mothers in the U.S. are *less* vulnerable to depression than new fathers, but this is dependent on marital state. Unmarried mothers were more vulnerable to depression. Buber and Engelhardt (2008) using cross national data from Survey of Health Aging and Retirement (SHARE) for individuals aged 60+ who were out of the labour force found that childless men and women are more likely to report depressive symptoms. Furthermore, the number of children had a significant effect on the mental health of

males. Men with up to three children had significantly fewer depressive symptoms in comparison to the childless and fathers of 4 or more children.

One related strand of research is the research on happiness, which also shows mixed results on the effects of children. In recent years, nevertheless, following the seminal contribution by Richard Easterlin (1974, and for an update see 1995), a number of economists have investigated the impact of socio-economic conditions on different measures of Subjective Well-Being (henceforth, SWB)¹, measured as self-reported levels of happiness or life satisfaction (for an excellent review, see Dolan et al., 2008). These studies have focused on the effects of microeconomic conditions as well as macroeconomic conditions on individual well-being (e.g. Blanchflower, 2008; Di Tella et al., 2003). Some of these papers include as additional determinant of SWB, the number of children at home. A majority of these papers indicate that this variable has a negative or no effect on happiness or life satisfaction (Di Tella et al., 2003; Alesina et al., 2004; Clark, 2006; Caporale et al., 2009, among others). These studies are limited to samples of individuals aged 15 or older, or cross national variation or a single country. Since the effect of number of children is not the focus of these papers, the subject is not given additional attention. Only one of these papers (Alesina et al., 2004) look at the effect of number of children between 8 and 15 years on subjective well-being, but they did not examine sex differences in the effects of children.

In contrast, other researchers report positive effects of the number of children on happiness or life satisfaction (for example, Clark & Oswald, 2002; Frey & Stutzer, 2006; Haller & Hadler, 2006; Billari, 2008). One important issue that has been largely

¹ SWB have been extensively studied in other disciplines such as psychology (see, Kahneman *et al.*, 1999; Argyle, 2002) and sociology (Veenhoven, 1997).

neglected is that the effect of children on SWB might not be the same across population sub-groups. Angeles (2010a, 2010b) examines population sub-groups using 15 waves of the British Household Panel Survey (BHPS), and provides empirical evidence that the effect of children on life satisfaction of married individuals is small, often negative and never statistically significant. He also employs different types of life satisfaction as dependent variable in order to examine the impact of children on life satisfaction: “satisfaction with partner or spouse”, “satisfaction with social life”, “satisfaction with amount of leisure time”, and “satisfaction with use of leisure time”. He considers as children those individuals who are less than 16 years old. However, he ignored the role of respondent gender and age of the children when explaining different types of life satisfaction.

In sum, the empirical evidence on the effect of children on depression and other measures of well being, and whether these effects differ for men and women, is limited and the results are mixed. Empirical studies of depression vary in their methodology (cross-section/longitudinal data), the time period/region country covered, the inclusion of control variables, and the measure of depression employed (single vs multidimensional). It is therefore difficult to draw a clear conclusion on the association between children and depression and if this differs for men and women. There have been no previous studies analyzing the relationship between children and depression in Korea. Other studies have had a different focus, for example, the relationship between obesity and depression (Kim et. al., 2010) and the relationship between various social, physiological and psychological resources and depression (Nam et. al, 2011).

The primary goal of this paper is to examine how the association between children and depression vary by gender using the third round of the European Social Survey (ESS)

and data from the Fourth Korean National Health and Nutrition Examination Survey (K-NHANES). South Korea is economically similar to Europe (with 2010 GDP PPP (purchasing power parities) of about \$1,467 millions, compare to Spain with 2010 GDP PPP of \$1,374 millions) but historically and culturally very different (World Fact Book, 2011). The use of both European data and non-European data enables us to determine whether and how cultural setting influences the relationship between children and depression for men and women.

Unlike Van de Velde et al. (2010), we examine the presence of children at home regardless of age. We do this because women tend to shoulder more of the burden of childcare and housework than men, and therefore the presence of children in the household is likely to affect women more than men. Also unlike Van de Velde et al. (2010), we control for all the major factors known to influence depression, including age, self reported health, employment status, income, marital status, and education. Depression tends to increase with age, and this pattern seems to take the shape of a curve in the latter stages of life (e.g. Costa-Font & Gil, 2008; Van de Velde et al., 2010). Similarly, negative experiences such as unemployment increase depressive mood (Jahoda, 1982; Miech & Shanahan, 2000). On the other hand, marriage and partnership act as a protective factor against depression (e.g. Weissman et al., 1993; Murray & López, 1994; Prince et al., 1999; Van de Velde et al., 2010). High levels of education also protect against depression, in part because they are associated with higher socioeconomic status (Minicuci & Noale, 2005; Ross & Mirowsky, 2006), although Brambra et al. (2008) also find a higher risk of poor self-reported health among highly educated women.

For the European data, this study uses a multilevel models are used. These are also known as hierarchical linear models (Bryk & Raudenbush, 1992), random effects or

random coefficients models (Diggle et al., 1994) and covariance component models (Dempster et al., 1981). This analytical approach allows us to control for both characteristics of the individuals' social context in addition to their own characteristics. This methodology is particularly appropriate with a large cross national data base such as the ESS, as within country observations are not independent of each other and ordinary linear modelling is likely to give biased results. Multi-level modelling also enables us to examine whether characteristics of the particular society influence the effects of children on depression. In particular, we control for societal affluence as measured by GDP per capita. Societal affluence may be expected to decrease the experience of depression as basic needs are more likely to be met in more affluent societies than in less affluent societies (Hopcroft & Bradley, 2007). For the Korean data, this study uses probit regression models, which are appropriate given the binary nature of the dependent variable (whether or not depression has been experienced).

Given the cross-sectional nature of the data we are not able to give our results in terms of cause- effect but in terms of association. Indeed, one clearly might argue that there is potential reverse causality between depression and children. That is, depression and stress can contribute to reduced fecundity, and would contribute to reduced subsequent fertility (e.g. Abbey et al., 1992; Zemishlany & Weizman, 2008) but this is beyond the scope of this paper. The key contribution of this paper is to adopt a comparative perspective of the relationship between children and depression and determine if this varies for men and women.

2. Measuring depression and data

The empirical analysis is based on two sources - the third round of the European Social Survey (ESS-3: <http://www.europeansocialsurvey.org/>) and the Fourth Korean National Health and Nutrition Examination Survey (henceforth, K-NHANES).

The ESS was fielded in 25 European countries in 2006 and 2007, funded by the European Commission, the European Science Foundation, and scientific funding bodies in each of the participating countries. The ESS selected respondents using strict probability samples of the resident population aged 15 or older living in private households. Only one individual per household is eligible for participation. The data used here were taken from edition 3.2 of the ESS data which includes 23 countries. The 23 countries were: Austria, Belgium, Bulgaria, Switzerland, Cyprus, Germany, Denmark, Estonia, Spain, Finland, France, United Kingdom, Hungary, Ireland, Netherlands, Norway, Poland, Portugal, Russian Federation, Sweden, Slovenia, Slovakia and Ukraine.

The ESS contains a core module covering standard socio-demographic characteristics, social and moral values, attitudes towards ethnicity and religion. In round 3, the questionnaire incorporates measures of social and interpersonal well-being (Well-Being Module)². The final module comprises 54 items. The Well-Being Module includes two complementary methodologies: (i) general evaluative questions that assess the individual's feelings and functionings (within or across domains) (ii) and more specific questions that ask about experiences in the past (for more details, Huppert et al., 2009). Data were gathered via face- to- face interviews lasting approximately one hour by a trained ESS interviewer. So far four rounds have been conducted. The distribution of the sample size across countries is displayed in **Table 1**. The sample size varied between 995

² For a detailed review, see Huppert *et al.* (2009).

(Cyprus) and 2,916 (Germany). The total sample was around 43,000 respondents. In the original sample, there were more women than men, with 19,530 males (45 %), and 23,373 females (55 %). Most interviews were done in Germany (5,712). Only 1,481 interviews were done in Cyprus. On average 3,141 interviews were done per country. Additionally, the ESS aimed at a minimum response rate of 70 percent. This was not achieved in all countries, and the response rates varied from 45.97 % in France to 73.19 % in Slovakia. Average response rate was 62.6% (see **Table 2** for details). One important aspect of survey questions is whether they are directly comparable in different languages. Great efforts were made in the ESS to ensure equivalence of questions across countries/languages (Jowell et al., 2007). Our analysis was restricted to respondents aged 18-75 years of age. After restricting the original sample, and removing missing values, the analysis was based on a subset of the ESS with 4,696 (47%) males and 5,287 females (53 %).

Data for Korea were taken from the fourth wave of the Korean National Health and Nutrition Examination Survey (K-NHANES) in 2008, a nationally representative cross sectional household health survey conducted by the Ministry of Health and Welfare. The survey gathers information from the respondents via face to face interviews, including socio-economic status, self-reported health status, incidence of acute and chronic illness, health behaviour (exercise, smoking, and alcohol consumption), health care services utilization, and spending on health. The present analysis was restricted to respondents aged 19-75 years, as respondents younger than 19 or older than 75 could have specific risks such as hormonal shifts in puberty and sickness at old age. Among total sample of 6,751 respondents after restricting the original sample, there are more females (57%) than males (43%).

Table 1. Sample size

Country	All	Male	%	Female	%
Austria	2,405	1,118	5.7	1,287	5.5
Belgium	1798	840	4.3	958	4.1
Bulgaria	1400	546	2.8	854	3.7
Switzerland	1803	815	4.2	988	4.2
Cyprus	995	474	2.4	521	2.2
Germany	2916	1437	7.4	1479	6.3
Denmark	1505	738	3.8	767	3.3
Estonia	1517	660	3.4	857	3.7
Spain	1876	902	4.6	974	4.2
Finland	1896	919	4.7	977	4.2
France	1986	930	4.8	1056	4.5
United Kingdom	2394	1079	5.5	1315	5.6
Hungary	1518	627	3.2	891	3.8
Ireland	1734	790	4.1	944	4.0
Netherlands	1889	868	4.4	1,021	4.4
Norway	1750	891	4.6	859	3.7
Poland	1721	815	4.2	906	3.9
Portugal	2222	863	4.4	1359	5.8
Russian Federation	2437	983	5.0	1454	6.2
Sweden	1926	951	4.9	975	4.2
Slovenia	1476	667	3.4	809	3.5
Slovakia	1737	841	4.3	896	3.8
Ukraine	2002	776	4.0	1226	5.2
Total	42903	19530	100	23373	100

Source: European Social Survey, third round.

Table 2. ESS response rates by country

Country	Achieved interviews	Response rate (%)
Austria	3800	63.96
Belgium	3249	61.01
Bulgaria	2357	64.75
Switzerland	3713	51.54
Cyprus	1481	67.32
Germany	5712	54.47
Denmark	3000	50.78
Estonia	2800	64.97
Spain	3290	65.94
Finland	3000	64.4
France	4680	45.97
United Kingdom	3014	54.47
Hungary	2635	66.06
Ireland	3400	56.76
Netherlands	3254	59.8
Norway	2750	65.52
Poland	2574	70.19
Portugal	3135	72.76
Russian Federation	3551	69.45
Sweden	3000	65.88
Slovenia	2340	65.05
Slovakia	2500	73.19
Ukraine	3014	66.42
Average	3141	62.64

Source: European Social Survey (ESS), third Round

Dependent variables

In the ESS data, our measure of depression is the eight item version of the Center for Epidemiological Studies Depression Scale (CES-D (Radloff, 1977; Steffick, 2000)). The CES-D scale has demonstrated reliability in measuring emotional distress in both adults and adolescents (Radloff, 1977; Roberts, 1995; Cornwell, 2003; Nomaguchi & Milkie, 2003; Van de Velde et al., 2010). This measure derives from the respondents'

answers to the question: “How often in the week before the survey did they feel or behave in 8 ways: (1) felt depressed, (2) felt that everything was an effort, (3) sleep badly, (4) felt lonely, (5) felt sad, (6) could not get going, (7) enjoyed life, and (8) felt happy”. Response categories range from 0 (none or almost none of the time) to 3 (all or almost or all of the time). We generate a total score for each individual by the unweighted sum of the items. Thus, this measure ranges from 0 to 24 with higher values indicating a greater frequency and severity of depressive symptoms or poor psychological well-being. Two items (7) and (8) are worded positively. Reversed scores were employed for these positive items. Taking all countries together, 4,598 respondents have missing values on the items of depression score. Cases with missing values on different items of depression scale (all countries) were excluded.³ It is important to note that the CES-D measure was designated as a scoring measure of depression, not a diagnostic measure. It is not a full measure of the symptoms of depression. This measure is a self-reported measure that might also pick up cultural differences across nations in the description of subjective feelings.

Table 3 displays the mean depression scores across countries and gender. As can be seen in the table, there are cross-national variations in depressive mood across European countries. On average, Norway reports the lowest depression scores (4.17), followed by Switzerland (4.65) and Denmark (4.71). The highest average depression scores are found in Hungary (8.4), Ukraine (8.22), and Russian Federation (7.68). Moreover, in all countries, on average men report a better psychological well-being (5.38) than women (6.38). In all countries, women report higher levels of depression than men do. Men in Hungary, Ukraine, and Slovakia men report higher depression scores

³ Results available upon request.

than other countries, while women in Ukraine, Hungary, and Russia report higher depression scores compared to other countries.

Table 3. Average scores of depression by country

Country	All	Male	Female
Austria	5.31	5.13	5.46
Belgium	5.41	4.73	6.02
Bulgaria	7.37	6.68	7.8
Switzerland	4.65	4.3	4.95
Cyprus	5.09	4.37	5.73
Germany	5.92	5.6	6.25
Denmark	4.71	4.46	4.96
Estonia	6.53	6.16	6.83
Spain	5.4	4.8	5.97
Finland	4.91	4.8	5.03
France	5.55	4.86	6.18
United Kingdom	5.77	5.27	6.19
Hungary	8.4	8	8.71
Ireland	4.83	4.79	4.87
Netherlands	5.19	4.6	5.71
Norway	4.17	3.98	4.37
Poland	6.57	5.99	7.12
Portugal	7.43	6.39	8.1
Russian Federation	7.68	6.81	8.3
Sweden	4.92	4.46	5.38
Slovenia	5.53	4.46	5.38
Slovakia	7.2	7	7.37
Ukraine	8.22	7.21	8.88
Total	5.92	5.38	6.38

Source: European Social Survey (ESS), third Round; own calculations.

In the K-NHANES data, self-reported depression is measured as a binary variable, whether or not depression has been experienced by the respondent in the past 12 months.

Table 4 displays the frequency of self-reported depression by gender and number of children for South Korea. Furthermore, the reported levels of depression are higher for males and females having children (9 % and 24%) at home compared to not having children at home (5% and 19%).

Table 4. Depression ratio with the Korean National Health and Nutrition Examination Survey (K-NHANES)

	Male	Female
Presence of child at home (No)	9.60%	24.12%
Presence of child at home (Yes)	4.97%	18.89%
With one child	7.26%	22.78%
With two children	3.55%	17.10%
With three children	1.18%	16.15%

Source: Korean National Health and Nutrition Examination Survey (K-NHANES).

Own calculations

Note: Depression ratio associated with four or more children was omitted due to small samples.

Independent Variables

Age is measured in both the ESS and K-NHANES data sets as the individual's age in years. To account for a non linear association between age and depression, age and age squared were included in the model (e.g. Mirowsky & Ross, 1992; Van de Velde et al., 2010).

In the ESS, *health status* is assessed by the following question in the survey: "How is your health in general: would you say it is...?". The available answers are: very good, good, fair, bad and very bad. Higher scores indicate poor subjective health (1= very good; 5 = very bad). This health indicator has been found to be appropriate for comparative studies on determinants of self reported health (e.g. Kunst et al., 1995). In the K-NHANES data set, health is a binary variable, 1= bad or very bad, 0 =otherwise.

For *marital status*, we use dummy variables for married, divorced, widowed and separated in both the ESS and K-NHANES datasets.

In the ESS, *educational level* is measured by the total number of years of full time education based on the question: “About how many years of education have you completed, whether full time or part time?” In K-NHANES data set, it is measured by a binary variable, 1= low education (middle school or less), 0= otherwise.

To take into account *employment status*, in the analyses of the ESS data we include two dummy variables for unemployment status: whether “the respondent has any periods of unemployment over the last 12 months” and whether “the respondent has any periods of unemployment over the last five years”. In the K-NHANES data, we include a binary variable, 1= employed, 0= not employed.

Household income in the ESS is measured as the total net income of the household, from all sources. The ESS does not have household income data for all cases in all countries so including this variable decreases the number of cases by approximately 26%, so this variable is not included in all the analyses of the European data. The K-NHANES data also has a variable for average household monthly income (income, included here as a logged variable).

In the ESS, we look at *children* living currently at their parents’ home, measured by a dummy variable whether there are children at home (0 = no, 1 = yes). 48% of respondents report to have at least one child living in the household with them. In the K-NHANES data, we have two variables to measure parenting status, a binary variable for a person living with children, 1=yes, 0= no and another variable for total number of children whether living in the household or not. 65% of the respondents in this data report living with at least one child.

In the analysis of the European data, one macro variable was included in the study. This is *GDP per capita* for the year 2006 extracted from the Penn World Tables, Mark

6.3 (Heston et al., 2009). GDP per capita is frequently used as a measure of societal affluence. In this data set, it also captures some of the effect of income inequality, as it positively correlated with the gini coefficient measure of income inequality ($r = 0.49$).

All variable definitions and sample means of the variables for both the European and Korean data are provided in **Appendix A**.

3. Statistical model

To take both the individual and societal context into account, multilevel modeling was employed in the empirical analysis of the European data (Goldstein, 1995; Kreft & deLeeuw, 1998). When using data from various countries such as we do here, observations belonging to the same country are not independent, and therefore single models are not valid for explaining hierarchical data. Disregarding this hierarchy and using standard methods (OLS) will give biased and misleading results (Hox, 2002). The aim of multilevel analyses is to estimate variance at the two levels effects (i.e. individual and country level). The total variance is split into between nation and within nation variation. The intra-class coefficient indicates the proportion of the total variation in depressive symptoms that can be accounted at national level. By using multilevel modeling with a two level approach, the European data were analyzed as regression with hierarchical models in which units at the first level of analysis (individual respondents) were treated as nested within units at the second level of analysis (countries). Multilevel models are estimated by using the GLLAMM (Generalized Linear and Latent Models) package in STATA v.10 (for more details, see Rabe-Hesketh et al., 2004).

The Korean data were analyzed using probit regressions. Empirical analyses were carried out using STATA Version 10.0.

4. Results

ESS (Europe)

In the European data, five models are estimated. First, a baseline model is estimated including only individual level predictors (e.g. gender, age, education, health status, marital status, unemployment, and living with children). We include one random intercept and one random coefficient (for male). The first represents the unique effect of each country in addition to the fixed intercept and the second represents the differential effect of being male in each country in addition to the fixed effect of being male. In the second model, the interaction between living with children and gender is included. In the third model, the country level variable (GDP) was entered along with individual level predictors. In what follows we summarize the estimation results presented in **Table 5**, Models 1, 2 and 3.

The results for Model 1 confirm the epidemiological findings that men report lower levels of depression. The coefficient on the gender variable is negative and statistically significant. Also as expected, age is positively and significantly associated with depression form men and women. In addition, we find a non-linear relationship between age and depression, as the squared term is negative and significant. This is consistent with previous findings that depression peaks in middle age (55-64) and then falls off (after 65) (Costa-Font & Gil, 2008; Van de Velde et al., 2010). Also as expected, poor individual health promotes depression (Hopcroft & Bradley, 2007). Education is also negatively associated with depressive mood, showing that more years of education are associated with lower levels of depression. This result is also in line with previous studies (for example, Van de Velde et al., 2010). Being unemployed is associated with

more depression. Last, the results also show that being married is negatively associated with depression, while being divorced, widowed or separated are associated with poorer mental health than being single. With regard to our variable of interest, the coefficient for the dummy variable ‘having children at home’ is not significant.

The random intercept in Model 1 is not significant, showing that there are no unmeasured effects on depression associated with each country that are not captured in the fixed effect model. The random effect of being male is significant, showing that the effect of gender on depression differs significantly depending on the country, as suggested by **Table 3**. This may reflect cultural differences in how males and females report symptoms of depression, or it may reflect real differences in the effect of gender on depression by country. The covariation (not shown) between these random effects is not significant, however, suggesting there are no other factors associated with country that have been omitted from the model.

The next model (Model 2) includes all variables and the interaction between children and gender. This is significant, and indicates that the presence of children has opposite effects on the mental health of men and women. The result indicates that male respondents who have children at home have better psychological well-being than female respondents with children at home. Controlling for the differential effect of children on depression for men and women also reduces the size of the coefficient for the effect of gender on depression, although it remains significant at the 0.05 level. This means that part of the reason for the better mental health of men compared to women is the differential effect of children on men and women’s mental health.

The next model (Model 3) includes the country variable GDP. The individual predictors that were significant at the baseline models were again significant in the full

model. The magnitude of the coefficients remains more or less equal throughout of the models. Moreover, per capita income is negatively associated with depression mood and seems to be an important predictor of suicide. Depression levels tend to be lower in countries in which the GDP per capita is higher. One potential explanation is that higher levels of economic development are associated with higher incomes and higher living standards, which mean more resources are available to cope with life's stressful events or circumstances (Burr *et al.*, 1994), and of depression.

Models 4 explores this issue further and includes the variable household income, Model 5 also adds the country level predictor GDP. As can be seen in the table, including household income reduces the number of countries from 23 to 20 and the number of cases from 9,983 to 7,365. However, higher household income significantly reduces depression in both models 4 and 5. The coefficient for GDP per capita in Model 5 is no longer significant, suggesting that GDP per capita influences depression primarily by influencing household incomes, as suggested above.

In both models 4 and 5 the effects for gender, age, age-squared and health remain largely unchanged. However, in both models the coefficient for education becomes smaller and not significant, suggesting that higher education reduces depression by increasing household income. In both models the coefficients for unemployed in the last year and in the last five years both become smaller in magnitude, suggesting that unemployment influences depression in part by reducing household income. Similarly, controlling for household income reduces the mental health benefits of being married. The coefficients for divorced and separated are no longer significant, suggesting that the primary way these factors influence depression is by reducing household income. Last, the interaction of children by gender becomes smaller and only marginally significant (p

<0.1), suggesting that some of the positive effect of children on men's mental health compared to women's mental health is due to the fact that men with children at home tend to have higher household incomes.

Table 5. Multilevel Regression models of Depression, European Social Survey (ESS)

Variables	Model				
	(1)	(2)	(3)	(4)	(5)
Individual predictors					
Male	-0.529*** (0.090)	-0.342** (0.117)	-0.339** (0.118)	-0.414** (0.141)	-0.410** (0.143)
Age (years)	0.085*** (0.020)	0.086*** (0.000)	0.086*** (0.020)	0.080** (0.024)	0.080*** (0.024)
Age Squared*100	-0.102*** (0.023)	-0.101*** (0.022)	-0.102*** (0.022)	-0.103*** (0.026)	-0.103*** (0.026)
Health Status (5=bad, 1=good)	1.781*** (0.047)	1.780*** (0.047)	1.771*** (0.047)	1.717*** (0.054)	1.717*** (0.054)
Education (years)	-0.055*** (0.011)	-0.054*** (0.011)	-0.053*** (0.011)	-0.018 (0.013)	-0.018 (0.013)
Unemployed (last 12 months)	0.525*** (0.082)	0.518*** (0.082)	0.514*** (0.082)	0.414*** (0.094)	0.415*** (0.094)
Unemployed (last 5 years)	0.468*** (0.084)	0.463*** (0.084)	0.460*** (0.084)	0.273** (0.097)	0.273** (0.097)
Married (Ref.=single)	-0.986*** (0.109)	-0.964*** (0.109)	-0.976*** (0.109)	-0.752*** (0.123)	-0.756*** (0.124)
Widowed	1.657*** (0.231)	1.686*** (0.231)	1.1667*** (0.231)	1.325*** (0.270)	1.327*** (0.270)
Divorced	0.251* (0.148)	0.245* (0.148)	0.240* (0.148)	0.010 (0.166)	0.010 (0.166)
Separated	1.102*** (0.277)	1.098** (0.277)	1.103*** (0.277)	0.613* (0.330)	0.614* (0.330)
Child(ren) at home	-0.050 (0.092)	0.125 (0.116)	0.125 (0.116)	0.189 (0.134)	0.190 (0.134)
Household Income				-0.253*** (0.024)	-0.250*** (0.025)
Children at home X gender		-0.391** (0.013)	-0.394** (0.157)	-0.317* (0.179)	-0.321* (0.179)
Intercept	1.773*** (0.459)	1.652*** (0.462)	2.848*** (0.529)	3.049*** (0.540)	3.128*** (0.613)
Real GDP per capita			-0.000*** (0.000)		--0.000 (0.000)
Random Effects					
Intercept	0.041 (0.051)	0.042 (0.050)	0.049 (0.055)	0.079 (0.068)	0.111 (0.086)
Male	0.460** (0.149)	0.462** (0.155)	0.245** (0.085)	0.291** (0.109)	0.296** (0.130)
Log likelihood	-27,511.667	-27,508.466	-27,502.091	-20,143.399	-20,144.091
AIC	55,057.33	55,052.93	55,042.18	40,324.8	40,328.18

# of observations	9,983	9,983	9,983	7,365	7,365
Number of countries	23	23	23	20	20

Source: European Social Survey (ESS), third Round; own calculations. Significant at *.10, **.05, ***.001. Standard errors in brackets.

K-NHANES (Korea)

Probit regression results for the Korean data are reported in **Table 6**. The results in **Table 6** replicate many of the findings from the European data. Across all models 1 through 4, being male has a negative effect on having experienced depression. While age is positively associated with experiencing depression, the squared term is negative, indicating a curvilinear reverse U-shaped relationship between age and depression. Being in poor health, being divorced, having low education and being unemployed also increase depression in Korea as in Europe. However, being married does not serve to reduce the probability of experiencing depression in Korea compared to being single as it does in Europe. This may be because in Korea single people typically do not live away from their families, so remain part of a traditional family-oriented community. Similarly, being widowed or separated are not consistently associated with poor mental health in the Korean sample as they were in Europe. Household income is negatively associated with depression as it was in the European analysis.

As in the European data, children at home have different effects for men and women. The presence of children in the home do not cause less depression for men when income is controlled (see Models 1 and 2), but number of children in the home decreases the likelihood of experiencing depression for men only, whether or not income is controlled (see Models 3 and 4). This suggests, as with the European data, that one reason why men with children in the home have less depression than women is that they tend to be in households with higher incomes.

Table 6. Probit estimates of depression, Korean National Health and Nutrition Examination Survey

Variables	Children at home		Variables	Number of children at home	
	(1)	(2)		(3)	(4)
Age (years)	0.0277** (0.0117)	0.0342*** (0.0122)	Age (years)	0.0199 (0.0124)	0.0278** (0.0129)
Age squared/1000	-0.3107*** (0.1159)	-0.3779*** (0.1219)	Age squared /1000	-0.2469** (0.1227)	-0.3260*** (0.1286)
Poor health	0.5334*** (0.0449)	0.5226*** (0.0461)	Poor health	0.5341*** (0.0471)	0.5256*** (0.0484)
Married	0.0519 (0.0866)	0.0350 (0.0888)	Married	0.1215 (0.0952)	0.0812 (0.0970)
Widowed	0.1591 (0.1121)	0.0749 (0.1155)	Widowed	0.2108* (0.1227)	0.1186 (0.1260)
Divorced	0.4188*** (0.1355)	0.3681*** (0.1381)	Divorced	0.4986*** (0.1498)	0.4398*** (0.1519)
Separated	0.2177 (0.1713)	0.1810 (0.1756)	Separated	0.3563* (0.1924)	0.2910 (0.1965)
Employed	-0.1847*** (0.0437)	-0.1688*** (0.0446)	Employed	-0.1961*** (0.0457)	-0.1815*** (0.0467)
Low education	0.2559*** (0.0575)	0.2051*** (0.0601)	Low education	0.2554*** (0.0603)	0.2187*** (0.0628)
log(Income)		-0.0863*** (0.0268)	log(Income)		-0.0660** (0.0287)
Male	-0.4700*** (0.0719)	-0.5048*** (0.0742)	Male	-0.4614*** (0.0722)	-0.4834*** (0.0739)
Child_dummy	-0.0417 (0.0537)	-0.0210 (0.0560)	No. of Children	-0.0432 (0.0273)	-0.0315 (0.0286)
Male*Child_dummy	-0.1834** (0.0931)	-0.1442 (0.0955)	Male*No. of Children	-0.1385*** (0.0509)	-0.1232** (0.0515)
Constant	-1.6179*** (0.2367)	-1.2920*** (0.2611)	Constant	-1.4262*** (0.2513)	-1.2284*** (0.2759)
Pseudo R squared	0.1056	0.1069	Pseudo R squared	0.1114	0.1111
Log Likelihood	-2,396.1***	-2,291.4***	Log Likelihood	-2,185.2***	-2,097.3***
# of observations	6,400	6,161	No. of obs.	5,879	5,671
AIC	4,610.9	4,818.3	AIC	4,222.5	4,396.4
BIC	4,705.0	4,906.2	BIC	4,315.5	4,483.2

Note: Specification error tests associated with each maximum likelihood estimation were done by Akaike's information criterion (AIC) and Schwarz's Bayesian information criterion (BIC). Recognizing that, with AIC and BIC, smaller is better, the third model (i.e., a model with the number of children at home, when income is controlled) is best fitted.

5. Conclusion

In this study, we examine the determinants of depression, with special attention to the effect of children on depression and whether this varies by gender of parent. This was accomplished through the use of survey data from individuals living in 23 different European countries and Korea. We find that poor health, unemployment, being separated, divorced or widowed and low levels of education promote depression in both men and women. As with previous studies, we find that depression initially increases with age and then decreases, all else being equal. We also find that males are less likely to experience symptoms of depression, all else being equal.

Our primary finding is that one of the reasons for the sex difference in depression in both 23 European countries and Korea is that for men but not women, having children in the home reduces depression. The analysis suggests that this in part due to the fact that men with children at home tend to have higher household incomes, but this does not entirely explain the effect. Given that the burden of childcare tends to fall more on women than men, it is not surprising that children in the home influence the mental health of men and women differently. Women may experience greater stress from childcare, may be more involved in their children's lives and worry more about them, or they may find their activities and choices more restricted given their greater responsibility for children. Even when children are older and do not require so much direct care, women usually are responsible for household work such as shopping, laundry and cooking. While children may be the intended beneficiaries of these activities, men can also benefit from these activities and this may contribute to their better mental health.

The fact that we found these results in two regions of the world with very different cultures and histories suggests that it is not simply local culture that makes

children in the home a greater boost for the mental health of men than women. Given that all the countries examined here may be considered developed, industrial societies, we suggest instead that parenting in such societies is universally stressful and more stressful for women than for men. This may help account for the low levels of fertility currently found in all these countries.

We also find new evidence that country characteristics play an important role when explaining the depression gap across countries. Higher income per capita is associated with lower levels of depression for both men and women. We also found that higher income per capita affects depression primarily by influencing household income. This suggests that more resources in the home mean more ways to deal with stress. Also, the effect of gender on depression differs depending on the country – in some countries the gender difference is wider than in other countries. This may reflect cultural differences in the way men and women report symptoms of depression, or it may reflect real differences in the sex difference in depression by country.

The present study is not without limitations. An important limitation of this study is that our data are cross sectional and allows us to explore only one point in time. Our results on the effects of the presence of children in the home on mental health are correlational, not causal. Nor does it include all European countries. Future research would be to construct a cumulative dataset constructed by pooling together data from those countries that have at least fielded one the special Well-being Modules (third round, and sixth round, *forthcoming*). By combining both datasets, we will be able to expand the sample size and include more countries.

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Appendix A

Table 1. Variable definitions and sample means, ESS

Variable	Definition	Mean
Depression	Derives from the respondents' answers to the question: How often in the week before the survey did they feel or behave in 8 ways: (1) felt depressed, (2) felt that everything was an effort, (3) sleep badly, (4) felt lonely, (5) felt sad, (6) could not get going, (7) enjoyed life, and (8) felt happy	6.28
Male	Dummy variable: 1 = male 0 = female	0.48
Age	Age in years	43.5
Married	Dummy variable: 1= married 0 = otherwise	0.51
Divorced	Dummy variable: 1= divorced 0 = otherwise	0.11
Widowed	Dummy variable: 1 = widowed 0 = otherwise	0.04
Separated	Dummy variable: 1 = separated, 0 = otherwise	0.02
Education	Years of full time education completed	12.75
Children at home	Dummy variable: children at home (0 = no, 1 = yes)	0.48
Health status	Subjective general health, ordinal variable (5= very bad; 4 = bad; 3= fair; 2= good; 1 =very good)	2.23
Unemployment (in the last 12 months)	Dummy variable: 1 = if the respondent has any periods of unemployment over the last 12 months 0 = otherwise	0.46
Unemployment (in the last 5 years)	Dummy variable: 1 = if the respondent has any periods of unemployment over the last 5 years 0 = otherwise	0.49
Household income	Household's total net income, all sources	5.89
Real per capita income	Per capita income, chain 2005=100	28,263

Table 2. Variable definitions and sample means – South Korea

Variable	Definition	Total	Male	Female
		Mean	Mean	Mean
Depression	Depression (experienced): Yes=1, No=0	0.1477	0.0661	0.2076
Age	Age in years (between 19 and 75)	46.8	46.8	46.9
Male	Dummy variable: male=1, female=0	0.4297	1	0
Child dummy	Dummy for a person living with children	0.6476	0.6503	0.6455
No. of Children	Number of children	1.24	1.21	1.25
Married	Married or living with partners: Yes=1, No=0	0.7260	0.7614	0.6993
Widowed	A person whose spouse has died and has not married again: Yes=1, No=0	0.0775	0.0138	0.1255
Divorced	A person who is divorced: Yes=1, No=0	0.0267	0.0241	0.0286
Separated	A person who is separated: Yes=1, No=0	0.0156	0.0141	0.0166
Employed	Employed: Yes=1, No=0	0.5791	0.7238	0.4701
Low_Edu	Low education(middle school or less): Yes=1, No=0	0.3571	0.2897	0.4080
Poor health	Subjective physical condition: 1 for bad or very bad, 0 otherwise	0.2321	0.1741	0.2757
Income	Average household monthly income (10,000 KRW)	258.4	264.5	253.8