Late-life mental health in Europe: A controlled for measurement bias country level comparison

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Abstract

Objectives To investigate the influence of country of residence on depression and well-being among older Europeans, after establishing the between country measurement invariance of both constructs

Methods We employed a cross sectional nationally representative population based sample from the Survey of Health, Ageing and Retirement in Europe (SHARE). The analysis sample comprised 13498 older Europeans, from 10 countries. The EURO-D was used to measure depression and a well-being outcome was derived from self report items available in SHARE. The between country measurement invariance of both mental health outcomes was established using modern psychometric modelling techniques.

Results After adjustment for demographic characteristics Spain was the country scoring highest on depression and Denmark highest on well-being. Optimal mental health was associated with higher educational attainment and being married. After statistically controlling for the presence of chronic illnesses, older age was associated with more depressive symptomatology in men, but not women.

Discussion There is considerable between country heterogeneity in late-life mental health in Europe. The Scandinavian countries do best (low depression/high well being) followed by central European countries, while residents of Mediterranean countries report the worst mental health

Introduction

The 20th century witnessed significant improvements in somatic health in most countries including substantial increases in survival to older ages and large reductions in late age mortality. While the initial driver of population ageing in Europe has been falling fertility, these mortality changes have led to further population ageing in many European countries prompting increased interest in the quality of life at older ages including the important domain of mental health (Khaw, 1997) (Grundy, 2006). Ageing often involves increased exposures to events and conditions associated with higher risks of depressive illness, including bereavement, somatic illness and poverty, and rates of depressive illness are relatively high in older age groups, although it is still unclear whether they continue to increase in later old age. (Stock, Okun, & Wallman, 1983) (Roberts, Kaplan, Shema, & Strawbridge, 1997), (Copeland, Beekman, Dewey, Hooijer et al., 1999). It is also unclear whether older age is associated with reduced well-being as studies have reported conflicting results (Lawton, Parmelee, Katz, & Nesselroade, 1996).

Previous studies have reported associations between socio-demographic characteristics and late life depression (Kennedy, Kelman, & Thomas, 1991), (Jorm,1995), (Prince, Beekman et al., 1999). Women, the less educated and the unmarried appear to be at greater risk. Less is known about the effect of demographic characteristics on positive aspects of mental health, notably well-being, but, as might be expected, evidence suggest inverse associations to those

reported for depression with higher reported well-being among the married and those with higher levels of education (Stock et al., 1983), (Isaacowitz & Smith, 2003).

The concept of happiness, or satisfaction with life, is currently a major area of research in economics and psychology, and has also recently become part of the political discourse. Central in this area of research are country level comparisons of levels of happiness or life satisfaction (Veenhoven & Ehrhardt, 1995) (Alesina, Di Tella, & MacCulloch, 2004) (Borooah, 2006) including a global map of happiness recently published (White, 2007). A common feature of these studies is that they suffer from a major methodological limitation, since none has formally addressed the issue of between country measurement invariance. To engage in a meaningful country level comparison of a mental health construct, the measurement invariance of the construct under study needs to be considered due to the possible influence of language, culture, different levels of expectations for the future and other country specific biases on mental health assessment. Furthermore, we believe that to achieve a holistic representation of mental health on the country level, both well-being and depression (or other common mental disorder symptoms) have to be considered. As we have seen previous studies have either considered well-being (Delhey, 2003) (Borooah, 2006) or depression (Prince, Reischies et al, 1999), (Ferring et al, 2004), but to our knowledge, never both.

In this paper we use data from the Survey of Health and Retirement in Europe (SHARE) to derive invariant mental health measures for 10 European countries and to analyse country and socio-demographic differences in mental health, and their interaction, using these derived measures. National differences in these indicators may be valuable in providing insights into macro level influences on mental health in later life. What this study adds to the existing literature is the consideration of both depression and well-being as outcomes, thus offering a holistic view of late-life mental health, rather than a traditional lateral perspective. Furthermore, to our knowledge this the first country level mental health comparison, that takes into account the issue of between country measurement invariance, by employing modern psychometric modelling techniques, within the generalised structural equation modelling framework.

METHODS

Sample

SHARE is a multidisciplinary cross-national survey including data on the health, socio-economic status and social and family networks of individuals aged 50 or over. Here we employ data from 9 of the 11 European countries included in the 2004 SHARE baseline study, excluding Switzerland due to its poor response rate and Belgium (data not available at the time of the analysis). The countries included are drawn from Northern (Denmark and Sweden), Western (Austria, France, Germany, and the Netherlands) and Mediterranean regions (Spain, Italy and Greece) of Europe. Full details of the SHARE sampling

methodology have been reported elsewhere (Borsch-Supan & Jurges, 2005). Our initial sample comprised 6,782 male and 8,223 female respondents, 1502 of these had to be excluded due to missing items of data leaving a sample of 13498 respondents, 6180 (45.8%) male and 7318 (54.2%) female. The self completion section includes questions on the participants' mental health, relationships within the family and accommodation requirements among others.

INSERT TABLE 1 ABOUT HERE

Measures

Depression

The EURO-D is a depression scale that was developed and validated by the EURODEP Concerted Action Programme. The scale includes 12 items – depression, pessimism, wishing death, guilt, sleep, interest, irritability, appetite, fatigue, concentration, enjoyment and tearfulness (Prince, Reischies et al.).

Well – being

We selected 10 items from the self completion section of SHARE. Selection was made on the basis of the face validity of the items with respect to life satisfaction, presence of positive mood and happiness which are the three components of subjective well- being (Diener, Suh, Lucas, & Smith, 1999). Seven of the items were drawn from the CASP questionnaire included in SHARE (Wiggins, Higgs, Hyde, & Blane, 2004).

Socio-demographic characteristics

Age was recoded to a three category variable, the first group included participants aged 50-64 years old, the second participants aged 65 to 74 years, and the third participants aged 75 years or older.

Educational qualifications were classified according to the International Standard Classification of Educational Degrees (ISCED 1997) scheme (Hollfmeyer-Zlotnik & Wolf, 2004), and recoded to three categories; grouping together ISCED codes 0,1 and 2 (pre-primary level of education, primary level of education and lower secondary level of education); ISCED code 3 (upper secondary level of education) and ISCED codes 4,5 and 6 (post secondary non-tertiary education and higher qualifications).

Marital status was dichotomised into married or in a registered partnership and not married (widowed, divorced or separated, never married). Finally a variable indicating the number of chronic illnesses reported by the respondents (continuous summary variable) was derived.

Statistical modelling

Psychometric modelling

In a factor analytic framework measurement invariance is demonstrated when strict between-group factorial invariance is achieved. Factorial invariance for polytomous/ordinal items is achieved when measurement parameters (thresholds, factor loadings and their associated standard errors) function equivalently in each group of a multigroup Confirmatory Factor Analysis (CFA)

model. In order to estimate such a model we first had to establish the factorial structure of the EURO-D and the well-being items in our sample. Therefore, we first identified the appropriate factorial structure of the EURO-D and the well-being outcome using the pooled sample. We proceeded by estimating a between country multigroup CFA of the best fitting model, constraining the item loadings and thresholds (common threshold structure) as well as their respective standard errors to be equal across groups (countries). Latent trait scores derived from the multigroup CFA were calculated for both the EURO-D and the well-being outcome and were used in subsequent analyses. Latent trait scores can theoretically range from $-\infty$ (minus infinity) to $+\infty$ (infinity), but in practice the range is usually from -3 to 3.

Our modelling was based on a multivariate probit analysis with latent variables (Muthen, 1983) through a 2-parameter normal ogive item response model and its extension to polytomous/ordinal data (Muthen, 1984). All models were estimated with the Weighted Least Squares, mean and variance adjusted (WLSMV) estimator, with the Mplus 5 software (Mutthen & Muthen, 1998-2007). Model fit was assessed with the Comparative Fit Index (CFI), the Tucker Lewis Index (TLI) and the Root Mean Square Error of Approximation (RMSEA).

Multivariate Analysis of Variance (MANOVA)

The depression and well-being latent trait scores were entered as dependent variables in a Multivariate Analysis of Variance (MANOVA). Country, age,

educational level and marital status were entered as independent variables in the model, their effects therefore being adjusted. Main effects and all 2-way interactions were estimated.

INSERT FIGURE 1 ABOUT HERE

RESULTS

Factorial structure and between country measurement invariance of mental health measures

Depression

In the EURO-D literature there is no clear guidance on its factorial structure, although the results of previously reported Principal Component Analyses suggest a possible 2 factor solution (Prince, Reischies et al.). We began to examine its structure with an Exploratory Factor Analysis (EFA) suitable for binary variables. There were two eigenvalues larger than 1, indicating that two latent factors were necessary to account for responses to the EURO-D items. With the EFA results as a guide we proceeded by testing two restricted – CFA models for the EURO-D. We estimated firstly a model with two first order factors and secondly a general specific, bifactor model in which a global latent factor accounts for variation in all EURO-D items. Since both models were confirmed by the pooled sample data, we then performed a multigroup CFA, with a common threshold structure for all countries, for both models. The general specific model was superior in both the pooled sample and multigroup CFA and

is depicted in Figure 1. Further multigroup CFAs, with the general specific model, revealed measurement invariance of the EURO-D with respect to gender, age, educational attainment and marital status (results available from corresponding author). We calculated latent trait scores based on the general specific model and used the global EURO-D depression factor in all further analyses.

INSERT TABLE 2 ABOUT HERE

Well - being

The selected well being items were entered to an EFA suitable for ordinal level data. There were four eigenvalues greater than 1, indicating the presence of four factors. We proceeded by testing three competing CFA models based on the EFA results. These included (1) a model with four first order factors, (2) a model additionally including a second order factor and (3) a general specific model. The general specific was the best fitting model in both pooled sample and multigroup CFAs. Further multigroup CFAs employing our best fitting model, revealed the factorial and measurement invariance of our well-being outcome with respect to gender, age, educational level and marital status (results not presented here, available from corresponding author). Since we were interested in a population based continuum of well-being, we calculated latent trait scores based on the general specific model and used the global well-being factor in all further analyses.

Multivariate Analysis of Variance (MANOVA)

The multivariate Wilk's Lambda criterion indicated that the linear combination of the dependent variables was significantly associated with the main effects of country, age, education and marital status as well as the 2 way interaction of country with age in both men and women. The 2 way country by marital status and age by marital status interactions were significant only in women.

INSERT TABLE 3 ABOUT HERE

Depression

Overall the contribution of the combined independent variables to depression was 5.3 % (adjusted R^2 = 0.053) in men and 11.7% (adjusted R^2 = 0.117) in women. For both genders country of residence was the strongest predictor of depression, accounting for 1.2% of the overall variance in men and 1.6% in women. The estimated marginal means of depression by country are presented in Table 3 and plotted on Graph 1a. Spain was the country with the highest depression score; Austria and Denmark had the lowest scores for men and women respectively. Among both men and women depression was highest in the oldest age group. Education was inversely associated with depression in both men and women, with the least educated respondents having the highest depression score. Finally,

married respondents scored significantly lower on depression score than the not married.

The age by country interaction observed in both genders was due to the fact that the pattern of main effect of age varied, with France being the prime example, where the 75+ age group had the lowest depression score. Finally the country by marital status interaction observed only in women is due to the reversal of the main effect of marital status in Italy where married women scored higher on the EURO-D than their non married counterparts.

INSERT TABLE 4 ABOUT HERE

Well-being

The overall effect of the combined independent variables on well-being was 11.9% (adjusted R^2 = 0.119) for men and 20.3% in women (adjusted R^2 = 0.223). Country of residence, age, education, and marital status were all significantly associated with well-being, with country of residence again being the strongest predictor accounting for 3.1% of the overall variance of well-being in men and 6.6% in women. The main effect of country is plotted in Graph 2a. Denmark had the highest score on well-being; Greece and Italy the lowest. Well-being was inversely associated with age, with the 50-64 age group having the highest score. Furthermore, respondents with the highest educational qualifications (ISCED codes 4, 5 and 6) had the highest well-being. Finally, among men, married respondents had a significantly higher well-being score than the non married, but this association was not found among women.

The country by educational level interaction observed for females is due to a reversal of trend in Sweden and Greece. In most countries participants with the highest educational qualifications had the highest well-being but in Sweden and Greece the mean score for the most educated women did not differ from the mean score of the group with medium educational qualifications. The age by marital status interaction in women was due to the lack of a significant difference between married and not married participants within the 64-74 age group (difference is significant in the two remaining age groups)

Multivariate Analysis of Covariance (MANCOVA)

In the final stage of the analysis we performed a Multivariate Analysis of Covariance (MANCOVA), with the number of chronic illnesses reported by the respondents included as a covariate. The number of chronic illnesses reported by the participants was significantly associated with depression and well-being. This did not alter the remaining results which remained similar with the ones obtained from MANOVA, except that for both men and women, the main effect of age on well-being was no longer significant. For women, but not men, the effect of age on depression ceased to be significant (results available from corresponding author).

INSERT GRAPH 1 ABOUT HERE

DISCUSSION

Our results indicate that, after adjustment for socio-demographic characteristics, there is considerable between-country heterogeneity in both depression and well-being. This heterogeneity is unlikely to be an artefact of between country measurement bias, since the measurement invariance of measures of depression and well-being was established using modern psychometric modelling techniques. Our results therefore are unlikely to be influenced by any country level induced bias, such as cultural differences, differences in expectations and language, since these potential biases were explicitly controlled by our measurement model.

For Europeans aged over 50, the Scandinavian countries seem to do best (high well-being and low depression), followed by central European countries (medium or low depression, medium or high well being), while older people in Italy, Greece and Spain have the worst mental health (high depression, low well-being). Spain is the country with the highest average depression score and Denmark the country with the highest score on well-being. Our findings are generally in agreement with previous studies on depression(Copeland, Beekman, Dewey, Hooijer et al, 1999) and well-being (Delhey, 2003), despite the methodological differences with our study.

Older age was associated with reporting of more depressive symptoms and lower well-being, although this effect was mostly due to number of chronic illnesses. Among women, once the variance attributed to chronic illnesses was

statistically controlled, the effect of age on both depression and well-being disappeared, whereas in men the effect on depression remained significant. The attribution of the deterioration of mental health in late life to physical health has been widely reported (Roberts et al., 1997) (Whyte & Rovner, 2006) (Yang, 2007), but it seems that for older male Europeans the increase in depressive symptoms that is observed at older ages is not entirely attributable to physical health. Educational attainment was associated with better mental health (low depression, high well-being), and being married was equally beneficial (Ross & Mirowsky, 2006) (Kirkcaldy, Furnham, & Siefen, 2004) (Inaba et al, 2005), except among Italian women, for whom being married was associated with higher levels of depression.

With respect to gender, we confirmed one of the most robust findings in psychiatric epidemiology, with levels of depression being higher in women than men (Kessler et al., 1994) (Copeland, Beekman, Dewey, Hooijer et al, 1999). We note that although women uniformly score higher on depression in all countries, there are some notable departures from the general pattern. First, in Denmark the gender gap disappears, with men and women having similar mean scores on depression. Furthermore, the female excess in depression seems to be more prominent in Southern European countries, a finding in accordance with the EURODEP report (Copeland, Beekman, Dewey, Jordan et al,1999), but also in Austria. The implied statistical interaction of country and gender with respect to

depression was confirmed with an additional MANOVA where gender served as a predictor.

In contrast with our findings on depression, the pattern of country level mean scores on well-being was not uniform for both genders. In some countries women report lower well-being than men, whereas in others the opposite was the case. The additional MANOVA including gender as a co-variate revealed that there were no overall gender differences in well being, but a significant interaction between gender and country. Post hoc analysis revealed that the observed difference was mostly due to men in Austria, France and Greece reporting significantly higher well-being than women residents of these countries. These were the countries where the female excess in depression was most prominent. In the remaining countries, women reported similar well-being to men, or even higher well-being in the case of Denmark and Sweden.

A possible explanation for the interactions between gender and country with respect to both depression and well-being may be differences in gender roles. Differences in gender roles are thought to lead to differences in the experience of life events, which in turn may lead to depression (Nazroo, Edwards, & Brown, 1998), as well as access to resources such as social support that may buffer the effects of stress (Matud, Ibanez, Bethencourt, Marrero, & Carballeira, 2003). Southern European countries are characterised in many typologies as having a strong 'familistic' culture (Reher, 1998). Previous comparisons of levels of family support for older people have also found that these tend to be high both in

Southern Europe (where formal service provision is low) and in Austria and Germany (Pacolet J, Bouten R, Lnaoye H, & Versieck K, 1999). Possibly associated differences in women's actual and perceived responsibilities for caregiving may contribute to the country level variations in depression and the deterioration we identify although further research would be needed to see if this is the case.

Our results show that country of residence is more strongly associated with well-being than with depression, and that the association is stronger for women than men. These findings suggest that well-being is more dependent on country specific variations than depression and similarly that women are more influenced by these country specific variations than men. Further research is required to identify the relevant variables that explain the stronger association between country of residence and well-being, as well as the excess in the effect on women's mental health. A related implication of our findings is that when mental health outcomes are researched in sample comprised of several European countries, a multilevel approach should be adopted, since not accounting for country level heterogeneity may lead to biased standard errors and over rejection of the null hypothesis (Type A error).

Strengths of this study include the availability of a population based sample, the establishment using modern psychometric methods of between-country measurement equivalence of depression and well-being, and the inclusion of both in a country level comparison, whereas the analysis of complete data only

constitutes a notable weakness. Future studies are warranted to replicate our results in samples from countries other than the ones included here as well as identify the variables that are implied in the effect of country residence on mental health, particularly since this was found to be stronger than the effect of socio-demographic characteristics on well-being and depression. This will enhance our understanding of variations in mental health on the country, as well as on the individual, levels and will provide useful guidance for policy making and relevant to mental health population based interventions.

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Table1. Analysis sample stratified by country and socio-demographic characteristics

		Men	Women
Country	Denmark	503	560
	Sweden	913	973
	Austria	667	880
	Germany	815	914
	The Netherlands	850	974
	France	469	524
	Spain	595	845
	Italy	602	720
	Greece	766	928
Age	50 - 64	3393	4068
	65 - 74	1832	1923
	75+	955	1327
Educational status	ISCED-97 codes 0, 1,2	2777	3897
	ISCED-97 code 3	1963	2036
	ISCED-97 codes 4,5,6	1440	1385
Marital status	non married (widowed, divorced or separated; never-married).	1094	2560
	Married(or in registered partnership)	5086	4758

Table2. Goodness of fit criteria for pooled sample and multigroup CFA

		CFI	TLI	RMSEA
EURO-D	Pooled sample, 2 first order factors	0.946	0.962	0.041
	Multigroup CFA, 2 first order factors	0.933	0.946	0.046
	Pooled sample nested model	0.985	0.987	0.023
	Multigroup CFA nested model	0.963	0.969	0.035
		CFI	TLI	RMSEA
Well-being	Pooled sample, 4 first order factors	0.987	0.994	0.045
	Multigroup sample, 4 first order factors	0.935	0.973	0.100
	Pooled sample, 4 first order factors, 1 second order factor	0.980	0.991	0.054
	Multigroup sample CFA, 4 first order factors, 1 second order factor	0.932	0.958	0.101
	Pooled sample, nested general specific model	0.999	0.999	0.019
	Multigroup CFA, nested general specific model	0.963	0.979	0.077

Figure 1a. General specific EURO-D measurement model
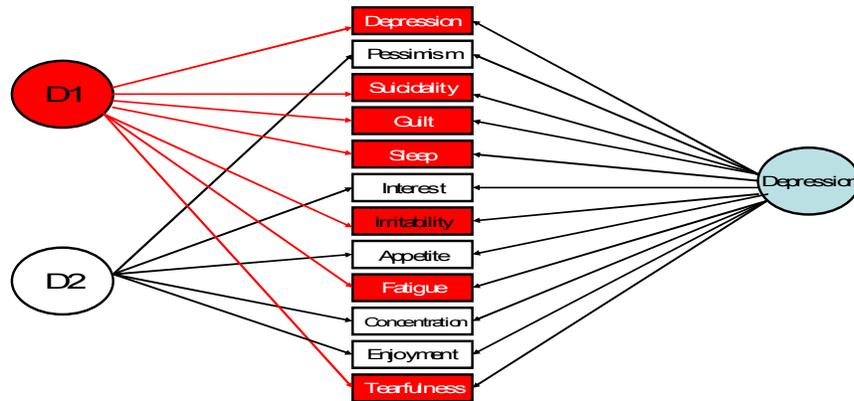
Figure 1b. General specific well-being measurement model
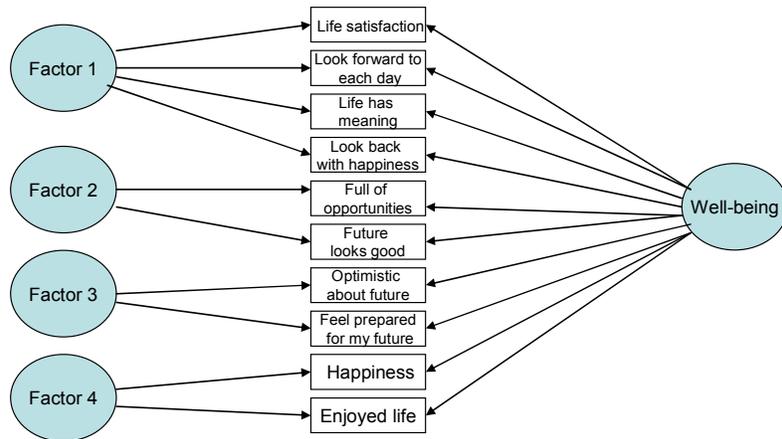
Table 3. estimated marginal means of Depression and Wellbeing scores from MANOVA model

	Men		Women	
	Depression	*Well-being*	*Depression*	*Well-being*
Country				
Denmark	-0.053	0.357	-0.009	0.565
Sweden	0.021	0.125	0.170	0.230
Austria	-0.079	0.099	0.114	0.013
Germany	-0.025	-0.233	0.130	-0.211
The Netherlands	0.053	0.207	0.162	0.228
France	0.136	-0.159	0.384	-0.227
Spain	0.320	-0.009	0.518	0.000
Italy	0.108	-0.301	0.298	-0.318
Greece	0.002	-0.279	0.235	-0.450
Education				
ISCED-97 codes 0, 1,2	0.084	-0.158	0.341	-0.217
ISCED-97 code 3	0.048	-0.052	0.19	0.012
ISCED-97 codes 4,5,6	0.029	0.146	0.137	0.149
Age				
50 - 64	-0.052	0.066	0.152	0.067
65 - 74	0.016	-0.008	0.196	-0.001
75+	0.197	-0.122	0.32	-0.123
Marital status				
Not married**	0.109	-0.113	0.296	-0.115
Married*	-0.002	0.070	0.149	0.077

* or in a registered partnership

** widowed, divorced or separated, or never married

Table 4. F criterion and corresponding p value of univariate between-subjects tests after MANOVA

	Dependent Variable	Men		Women	
		F	p	F	p
Corrected Model	*Depression*	5.690	0.000	13.241	0.000
	Well-being	12.225	0.000	24.510	0.000
Intercept	*Depression*	11.012	0.001	187.119	0.000
	Well-being	1.151	0.283	1.016	0.314
Country	*Depression*	6.044	0.000	11.339	0.000
	Well-being	20.231	0.000	48.844	0.000
Age	*Depression*	24.431	0.000	10.125	0.000
	Well-being	9.547	0.000	10.290	0.000
Education	*Depression*	1.153	0.316	21.219	0.000
	Well-being	20.855	0.000	44.891	0.000
Marital status	*Depression*	16.087	0.000	31.116	0.000
	Well-being	27.828	0.000	40.418	0.000
Country * Age	*Depression*	2.270	0.003	2.119	0.006
	Well-being	1.569	0.069	0.849	0.630
Country * Education	*Depression*	1.236	0.231	0.879	0.594
	Well-being	1.301	0.187	1.854	0.020
Country * Marital status	*Depression*	1.479	0.159	2.065	0.036
	Well-being	1.009	0.427	1.653	0.105
Age* Education	*Depression*	1.221	0.299	0.517	0.724
	Well-being	0.739	0.566	0.631	0.640

Age * Marital status	*Depression*	0.694	0.500	0.772	0.462
	Well-being	1.353	0.259	3.978	0.019
Education * Marital status	*Depression*	1.156	0.315	1.643	0.193
	Well-being	1.798	0.166	0.984	0.374

Graph 1a. Country level depression comparison
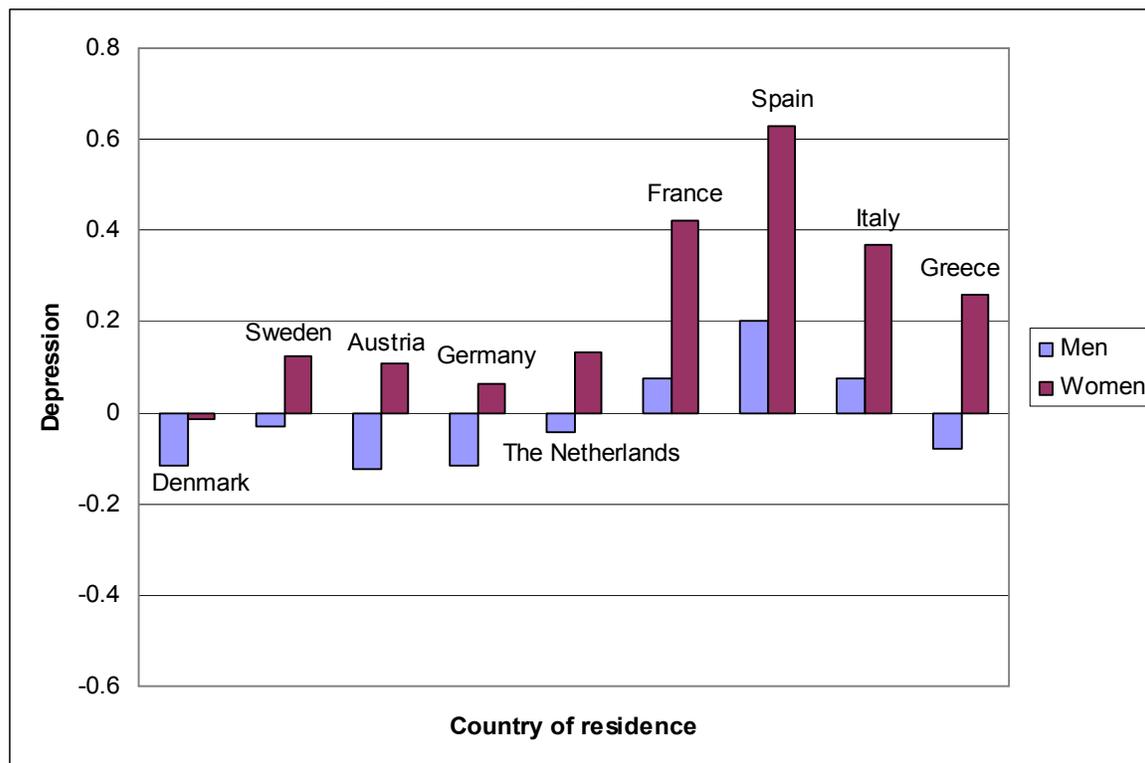
Graph 1b. Country level well-being comparison