Depression and Economic Status:

Evidence for Non-Linear Patterns in Women from Mexico

Background. While a social determinants of health perspective might lead to the hypothesis that higher economic achievements should be associated with better mental health, the evidence for adults is mixed and inconclusive. *Aims*. We test the role of wealth as a predictor of depressive symptoms controlling for a number of socio-demographic covariates, with a specific interest in gender-specific patterns. *Methods*. Using a nationally representative survey from Mexico (N=44,618), we carry out multivariate regression analysis where we jointly model linear and quadratic measures of wealth to detect non-linear relations between depression and wealth. *Results*. The paper reports clear evidence of an inverted-U relationship between depressive symptoms and wealth for females, whereas the relationship for males tends to be linear and decreasing with wealth as expected (though weak and significant only in the upper part of the wealth distribution). Our findings are robust to alternative empirical strategies and we discuss potential explanations for this novel finding. *Conclusions*. The paper confirms that the association between standards of living and depression is complex, due to the mediating role of socio-demographic characteristics and the existence of non-linearities not fully explored in the literature. *Declaration of interest*. None of the authors has interests to be declared.

Keywords: Depression; Economic Status; Gender Differences; Social Determinants; Mexico

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1. Introduction

Mental health conditions including particularly depression are among the leading causes of disability and health burden (Richards 2011; Patel et al 2016), have trended upwards for decades, and continue so to do (Murray and Lopez 1996; Moussavi et al 2007; WHO 2017). The significant costs to society include not just personal suffering but also poor educational outcomes, low work performance, unemployment, increased risk of early pregnancy, family disruption and deterioration of physical health (Kessler 2012). As a result, investments in the treatment of depression could yield substantial social returns (Chisholm et al 2016), though only a minority of affected individuals currently receive adequate treatment (Thornicroft et al 2017). These facts help to raise a number of important questions about the connection between economic status and depression and in this paper we particularly focus on two concerning the linearity and gendered nature of this relationship.

In the first place, and from a population health perspective, it is plausible to hypothesise that the relationship between economic status and mental conditions will be shaped by social determinants (Marmot 2005) and that economic hardship and stress related to socio-economic status are powerful drivers of mental illness (e.g. Ahnquist, Wamala and Lindstrom 2012). Secondly, it has also been long known that there are significant differences in the incidence of mental illness between the sexes (Weissman and Klerman 1977; Kessler et al 1993), with the greater susceptibility of females being confirmed in a number of cross-country studies (Hopcroft and Bradley 2007; Van de Velde, Bracke and Levecque 2010).[1] Putting these two research findings together, it would be reasonable to hypothesise that improvements in socio-economic conditions might lead to reductions in depression albeit from different starting points for men and women. Yet, as we shall show in this paper, evidence from Mexico suggests that the relation between economic status and depression is more complicated than this.

While the evidence from systematic reviews by Reiss (2013) and Devenish, Hooley and Mellor (2017) indicates that higher economic status improves mental health for children and adolescents, for adults the results are more open ended. A systematic review by Lund et al (2010), for example, finds that the relation between poverty and mental disorders is strong when poverty is measured in terms of

[1] This, in turn, has been attributed to gender heterogeneities in a range of factors that include coping mechanisms, temperament, physiology, sociocultural roles and vulnerability to adverse events (Perugi et al 1990; Nolen-Hoeksema, Larson and Grayson 1999; Piccinelli and Wilkinson 2000; Kuehner 2003; Hopcroft and Bradley 2007).

food insecurity, financial stress and housing, but 'more equivocal' (p. 517) when identified using income or consumption measures. Elsewhere, Zimmerman and Katon (2005) find that income becomes an insignificant predictor of depression when variables such as employment status and education are controlled for. On the other hand, Lahelma et al (2006) and Laaksonen et al (2007) find a significant predictive role for present and past hardship while typical socio-economic status indicators such as income and education exhibit no or even negative associations.[2]

In this paper, we contribute to this research on connections between economic status and depression by providing new evidence of an unexpected relationship for women. More specifically, and using a nationally representative survey, we provide evidence of a non-linear relationship between economic status and depressive symptoms for women in Mexico. This finding is in contrast to the negative linear (but mostly insignificant) relationship found for men and contra the simple social determinants hypothesis above. We consider particularly the robustness of the findings, which also shed new light on earlier work by Das et al. (2007) for Mexico,[3] and conclude by noting some important implications for the way in which mental health practitioners view economic status as a gendered protective or risk factor for depression.

2. Data and Methods

2.1 Data and measures

In our empirical analysis, we use the 2012 wave of the Mexican[4] National Health and Nutrition Survey, a nationally representative survey which follows a stratified probabilistic sampling design which employs the national census as a sampling frame. The sample size for the health module for adults we draw upon (individuals aged 20+) consists of 44,618 observations. One randomly selected respondent per household was presented with a reduced version of the widely used Centre for Epidemiologic Studies Depression Scale (CES-D) in the revised form by Eaton et al (2004). This is a battery of questions where each of them refers to the weekly frequency of occurrence of a depressive symptom (e.g. feeling oppressed, sad, being unable to sleep, etc.) – the options are "less than a day",

[2] Similarly, Chiavegatto Filho et al. (2013) find that income is not a significant predictor for either depression or anxiety. Other studies finding no significant associations between mental health outcomes and customary economic indicators include Gianaros et al (2007), Mendelson et al (2008) and McLaughlin et al (2012).

[3] The study by Das et al (2007, 2008) covers five developing countries including Mexico, and finds no systematic association between consumption and depressive symptoms. Results for Mexico are especially relevant for this paper: the bottom quartile is significantly less susceptible than the second and third quartiles, but it is not different from the richest quartile (their dummy for the fourth quartile is not significantly different from the first quartile in one specification and different only at 10% in another specification, see Table 3 p. 474). This means that the incidence of depressive symptoms they find in Mexico peaks in the middle region of the economic spectrum..

[4] In Mexico the life-time prevalence of major depressive episodes has been found to be significantly higher for women than for men – respectively 10.4% and 5.4%, see Rafful et al (2002).

"1-2 days", "3-4 days" and "5-7 days", and these are coded 1 to 4 respectively. Our dependent variable for depressive symptoms ranges from 0 to 7 and was generated as the count of items in which the respondent indicated either of the top two frequency categories – in other words, for each item a value of one is attributed to the "3-4 days" and "5-7 days" answers, zero otherwise, and these values are then summed. As the robustness checks indicate (see Appendix 1), our results are not sensitive to the way our outcome variable is constructed. It should be stressed that respondents' scores on the scale used do not define a diagnosis of illness.

We define economic status as household wealth. This is in keeping with Pollack et al (2007), Laaksonen, Tarkiainen and Martikainen (2009) and Sweet (2011), who stress how the buffer function of wealth makes it a more suitable indicator than income for health research; they also recommend its use together with other measures of socio-economic status such as education which is the strategy used here. More specifically, we measure wealth by developing an asset index based on Principal Component Analysis (PCA) – as is common practice – applied to information on 37 indicators of characteristics of the residential dwelling (walls, floors, roof quality of materials, etc.), access to basic services and utilities (source of water, rubbish disposal or electricity, etc.) and ownership of durable goods (computers, television, cars, etc.).[5] The full set of correlations between indicators is available in Appendix 2.A and a complete list, description, and weights of our indicators are available in in Appendix 2.B. The index ranges from 0 (worst-off household) to13.98 (best-off household).

2.2 Analysis

The core analysis of the paper comprises a set of regression models in which wealth is the focal independent variable – with linear and quadratic wealth terms being used to detect non-linearities. To model the count of depressive symptoms experienced by the respondent we use negative binomial regressions as they allow for over-dispersion in the data and fit the data particularly well (see subsection 3.1). Whilst we see the interpretation of our dependent variable as 'count' and the adoption of negative binomial regressions as the most appropriate strategy for the analyses, robustness checks show that our main results do not depend on either of these choices (see Appendix 1). The regressions shown in the paper are generated using the standard nbreg STATA command, which estimates negative binomials with a log-link function (Rogers 1993). Formally, the model to be estimated is:

$$(1) \qquad E(DS_i|X_i) = \exp\left(\beta_1 Wealth_i + \beta_2 Wealth_i^{\,2} + \tau Controls_i\right),$$

[5] This information is summarised with principal components analysis by using the first eigen-vector from the correlation matrix of our indicators as weights for the construction of the index. As pointed out by Kolenikov and Angeles (2009) and Howe et al. (2012) running customary principal components analysis in the presence of numerous binary and cardinal variables (as in our data) may produce incorrect results. We therefore adopt the methodology proposed by Kolenikov and Angeles (2009) and we run PCA using polychoric correlations. For our wealth index, the first component was able to reproduce 40% of the original covariance matrix. Finally, it should be noted that financial assets are not included in our measure of wealth.

where the expected value of the number of depressive symptoms of individual i, $E(DS_i)$, given a series of covariates X_i, is an exponential function of linear and quadratic $Wealth_i$ (the economic status of individual i) and $Controls_i$ (a series of control variables). This model is applied first to the whole sample and then to the female and male subsamples separately, in order to test for gender-based heterogeneity in the predictive role of economic status. To further examine this possibility, we also interact wealth variables with the gender dummy. [6] Our control variables include socio-demographic characteristics, as well as the presence of other health problems or stressors which can affect the likelihood of depressive symptoms. These are gender, education, age, civil status, employment status, relative deprivation (RD), limitation in daily activities, chronic illnesses, the presence of other health problems, having been victim of violence and household size. Descriptive statistics can be found in Table 1. 57% of our sample are women, around one in ten has no formal education, while 38%, 28% and 14% have completed, respectively, primary secondary and post-secondary education; 12% have university or postgraduate degrees. Mean age is around 44, mean household size is almost 4 and around half of our respondents are married.

[Table 1 about here]

3. Results

3.1 The overall picture

For all the negative binomial regressions we estimated the over-dispersion parameter alpha is different from zero, supporting the choice of using the negative binomial model (Long and Freese 2014). Furthermore, the negative binomial fits the distribution of the observed counts in depressive symptoms much better than its Poisson counterpart, as can be seen in Figure 1.[7] In the left panel of Figure 1, a mismatch can be seen between the observed distribution of depressive symptoms and the predicted distribution by the Poisson model; by contrast, the negative binomial predicts well the probability of 0 and 1 depressive symptoms, and follows very closely the observed distribution for values larger than 1. The right panel of Figure 1 shows the correlation with these predictions, indicating that the predicted Poisson model has a correlation of 0.846 ($p<0.001$) whilst the negative binomial shows a much higher correlation (0.998, $p<0.001$) with the data.

[Figure 1 about here]

[6] In particular, analysis by subsamples enables us to see whether a certain pattern occurs within the subsamples or not, while the adoption of an interaction term in the pooled sample enables us to see whether there is a significant difference in the role of a certain predictor (in our case economic status) across the subsamples identified by the interacted variable (in our case the gender dummy).

[7] The graph and the metrics presented in Figure 1 are produced on the basis of specification (4) in Table 3, estimated twice – via a Poisson and a negative binomial.

The first set of regression results are reported in Table 2. Specification *2* differs from specification *1* by including a quadratic term for wealth. While for wealth there is a significant negative coefficient in specification *1* ($p<0.01$), pointing to wealth as a negative predictor of depressive symptoms, this result changes with the addition of wealth squared. Linear wealth is positive while quadratic wealth is negative, both significant ($p<0.01$), suggesting an inverted-U relationship between mental health and economic status. Given the potential role of relative economic status (Eibner, Sturn and Gresenz, 2004, Pabayo, Kawachi and Gilman 2013 and Mishra and Carleton 2015), we run regressions 3 and 4 adding the Yitzhaki (1979) measure of relative deprivation (RD). As expected, RD has a positive and significant coefficient ($p<0.01$), confirming that lagging behind others in someone's social milieu is a risk factor for depressive symptoms.

Turning to absolute wealth, we see that in specification *3* this is not significant, which suggests that a simple measure of linear wealth is not a significant predictor of depressive symptoms when RD is controlled for. However, once quadratic wealth is added in specification *4* we again find strong evidence of a curvilinear relationship (linear and quadratic wealth are positive and negative, respectively, and for both $p<0.01$). It should also be noted that on the basis of criteria (Log-likelihood, Akaike and Bayesian Information Criteria) typically used to choose among competing models on the basis of data fit (Kass and Raftery 1995), specifications *1* and *3* are neatly outperformed by specifications *2* and *4*. We address the issue of collinearity, which could be a problem given that we employ variables potentially highly correlated. Relatively low figures for correlations, Variance Inflation Factors and Condition Indices offer a first reassurance regarding the extent to which collinearity could be a problem in our analysis (see Appendices 2.D-2.E); in addition, stepwise regressions as well as regressions estimated with de-meaned variables (granting lower Variance Inflation Factor and Condition Index statistics) fully confirm our results, with no loss of significance or sign switch for any variable (see Appendices 2.F-2.H).

[Table 2 about here]

In Figure 2, we illustrate graphically the relationship between wealth and depressive symptoms emerging from specification *4* (this is chosen as it is the best performing model, but figures derived from specification *2* are very similar). The left panel shows a clear inverted-U pattern for the predicted count of depressive symptoms at different levels of wealth. The right panel shows that over the large majority of the wealth domain marginal effects are statistically significant (confidence intervals do not overlap with the broken horizontal zero line), suggesting that in our data a marginal change in wealth is significantly associated with a change in depressive symptoms – a positive change in the lower part of the wealth distribution and a negative change in the upper part.

3.2 Depression, wealth and gender

We test whether the clear non-linear pattern described above holds across genders. In Table 3 we first split the sample into females and males (specifications *5-8*) and then using the pooled sample we interact wealth and gender (specification *9*). Looking at specifications *5-8*, linear or quadratic wealth are never significant for males but are significant for females ($p<0.01$). The message from specifications *5-8* in Table 3 is clear and twofold: first, the quadratic pattern found for the pooled sample is in fact driven by the female subsample and, second, wealth is not a significant predictor for males.

[Table 3 about here]

As we did in Figure 2, we plot predicted count and marginal effects at different levels of wealth in Figure 3, this time based on specification *9* and plotting separate lines for females and males – graphs produced from gender-subsamples regressions are very similar to Figure 2. The different story for females and males is very evident in Figure 3. The left panel shows a predicted count with a pronounced inverted-U shape for females but only a semblance of it for males. In the right panel, we can see again for females the pattern described above for Figure 2, with marginal effects which are first positive and then negative, and significant over almost the entire wealth domain. For males, marginal effects are much smaller in magnitude and their confidence intervals overlap with zero for the lower part of the wealth distribution and become barely negative for the upper part. This graphical analysis reveals evidence of a protective role of wealth at higher standards of living, albeit very small for males.

[Figure 3 about here]

Turning to regressors other than wealth, RD and gender, our estimations display a number of intuitive and reassuring pieces of evidence. As expected, health problems and limitations in daily activities are positive predictors of depressive symptoms, as is the case for age, household size and having been victim of violence ($p<0.01$), while education emerges as a protective factor ($p<0.01$). Civil statuses other than being married are also risk factors for females ($p<0.01$), whilst for males this is the case for statuses such as divorced and widowed ($p<0.01$) but not single and free union. A gender asymmetry also appears for the dummy variable denoting being employed, which is a negative predictor for males ($p<0.01$) but not for females.

4. Discussion

Our basic question was whether economic status and depression are associated and the evidence shows that this is the case but not in a simple linear or ungendered manner. The fact that rates of depression are higher for women than for men is well recognised in the literature, but the existence of a positive association between depression and economic status for women at the lower end of the income spectrum has received much less attention. Whilst the data do not enable a definitive identification of causes, we nevertheless discuss reasons for the inverted-U-shaped curve in gender by considering some possible drivers of our results.

Focusing on the positive relationship for women in the lower part of the income distribution, one possibility concerns the rise of risk factors associated with the development of multiple roles which might be poorly remunerated. Tacoli (2012), for example, argued that cash-based urban economies force women to work, from a young age, in low quality forms of employment (in terms of pay and formal protections) for long hours which are combined with significant amounts of unpaid caring duties. Similarly, Bardasi and Wodon (2006) discuss constraints on time use as important aspects of poverty, and how people on low incomes are required to work long hours. If women increase their labour market participation but social norms continue to allocate to them a high burden of unpaid caring activities, then they may face what Hammermesh and Lee (2003) describe as a 'time crunch'. Such an explanation may partially account for the differential pattern of non-monotonicity observed between men and women, and draws on factors that are, if not universal, certainly widespread around the world, UNDP (2015).

A second set of issues arises from autonomy, or its absence, across settings and situations from work (eg Rossler 2012) to old age (eg Bolye 2005) and relate in the Mexican context particularly to migration. It is well known that constraints on autonomy have a negative impact on mental health in the work place but there are also potential connections to demographic factors. Internal migration is particularly widespread in Mexico (Cazzuffi and Pereira-Lopez 2016) and the gender gap in wages is most disfavourable to women at the lower end of the pay spectrum (Gonzalez 2001). Together, these factors indicate that households that move are most likely to consider the economic opportunities of the male earner, which in turn is likely to both reduce the woman's contribution to household decision-making but also result in movement decisions that give less weight to female priorities including the maintenance of female social networks which may serve as protective factors for mental health (Rutter 1987; Fratiglioni et al 2000).

It also possible that women face different risk factors or react differently to such exposure – Cornaggia et al (2017) for example find that mental health was impacted less for women, by the financial crisis, compared with men.[8] It is known that women generally feel less safe walking around their local areas than men – assault and robbery have become significant features of everyday life in some parts of Mexico, Rios (2012) – and that exercise is a protective factor against depression (Perraton et al 2010). If increasing income for the poor is associated with women doing less physical work, and/or moving outside the house less, then it is possible that their differential reactions to such risk factors could be contributors to the patterns observed in our analyses.

It is important also to recognise the possibility that men and women may report symptoms on a different basis. Sigmon et al (2005), for example, find experimental evidence that men report fewer symptoms compared with women when there is likely to be greater follow-up to responses about their own health. In other words, and for whatever reason, men can be, compared with women, relatively more willing to avoid interaction with clinicians. Even so, in the context of this national survey, which had no expressed therapeutic purpose, it seems unlikely that fear of possible clinical follow-up was a predominant factor driving response.[9] A related possibility derives from the possibility of intra-cultural differences. Bhugra (2003), for instance, has shown that acculturation (as measured by language fluency) is positively related to the reporting of depressive symptoms and it is possible that women from the poorest households are in effect also less acculturated than others. Men from very poor households, by contrast, generally spend more time outside the house with other adults and so are less likely to suffer from low levels of acculturation.

Limits of the Study

Finally, it should be recognised that our analysis relies on aggregate household wealth and we are therefore unable to investigate intra-household allocation dynamics, or female and male wages or personal incomes. Our data are cross-sectional in nature and so we cannot make definitive statements about the implications for depression of a change in an individual's economic status. Another limitation of the investigation derives from the fact that, as acknowledged by Tsai (2014), the CES-D scale may lead to an overestimation of depressive symptoms. That said, in Santor el al. (1995), overestimation is related to the adoption of standard cut-offs in the CES-D scale, an issue which does not apply here given the series of robustness checks carried out.

[8] The finding is interesting and could be a more substantive frame – women are more resilient – or a more methodological explanation – male responses are more sensitive to environmental changes. We thank an anonymous referee for raising the issue.

[9] Men may well be more averse to seeking help for mental illness than women. This could help to explain higher self-reported rates for women but it is less easy to see how this could explain the non-linear pattern we observe for women but not for men.

5. Conclusion

In this paper we presented robust evidence of a highly significant non-linear relationship between wealth and depression for women, which differs from the mostly linear, but barely significant, relationship we found for men. We motivated our choice of negative binomial regression models for our main analysis on the basis of the characteristics of our data, but our findings are not driven by these modelling choices as the main results are fully confirmed by a number of checks based on alternative econometric models and specifications of the dependent variable. We discussed some possible explanations of our findings: three are substantive in character and one can be classed as methodological as it relates to a form of reporting bias.

While our data do not enable us to distinguish between these possible explanations or formally identify causality, we believe the paper is the first to show such a robust gender-based non-linearity in the relationship between economic status and depressive symptoms. The paper therefore confirms that the relationship between economic progress and depression is complex and mediated by socio-demographic characteristics. Further research that tests and enriches our findings, for example by using panel data, could be of significant value to policymakers and practitioners alike in understanding better who is at risk of depression and how these risks are related to improvements in standards of living.

References

Ahnquist, J., Wamala, S. P., & Lindstrom, M. (2012). Social determinants of health–a question of social or economic capital? Interaction effects of socioeconomic factors on health outcomes. *Social Science & Medicine*, *74*(6), 930-939

Blehar, M. C., & Oren, D. A. (1995). Women's increased vulnerability to mood disorders: integrating psychobiology and epidemiology. *Depression*, *3*(1-2), 3-12

Bhugra, D., 2003. Migration and depression. *Acta Psychiatrica Scandinavica*, 108(s418), pp.67-72.

Boyle, G., 2005. The role of autonomy in explaining mental ill-health and depression among older people in long-term care settings. *Ageing and Society*, 25(05), pp.731-748.

Cheema, F., Phanwar, I. A., Zia, S., & Rasool, M. (2014). Exploring the personality traits as cause of compulsive buying behavior. *Journal of Business Strategies*, 8(2), 19-IX

Chiavegatto Filho, A.D.P., Kawachi, I., Wang, Y.P., Viana, M.C. and Andrade, L.H.S.G., 2013. Does income inequality get under the skin? A multilevel analysis of depression, anxiety and mental disorders in Sao Paulo, Brazil. *Journal of epidemiology and community health*, pp.jech-2013.

Chisholm, D., Sweeny, K., Sheehan, P., Rasmussen, B., Smit, F., Cuijpers, P., & Saxena, S. (2016). Scaling-up treatment of depression and anxiety: a global return on investment analysis. *The Lancet Psychiatry*, *3*(5), 415-424

Cho, M.J., Kim, J.K., Jeon, H.J., Suh, T., Chung, I.W., Hong, J.P., Bae, J.N., Lee, D.W., Park, J.I., Cho, S.J. and Lee, C.K., 2007. Lifetime and 12-month prevalence of DSM-IV psychiatric disorders among Korean adults. *The Journal of nervous and mental disease*, 195(3), pp.203-210.

Cornaggia, C. M., Beghi, M., Mezzanzanica, M., Ronzoni, G., Vittadini, G., & Maffenini, W. (2017). Psychotropic Drug Consumption and Employment Status in Time of Economic Crisis (2007–2011). *Psychiatric Quarterly*, *88*(2), 371-384

Das, J., Do, Q.T., Friedman, J., McKenzie, D. and Scott, K., 2007. Mental health and poverty in developing countries: Revisiting the relationship. *Social science & medicine*, 65(3), pp.467-480.

Das, J., Do, Q.T., Friedman, J., McKenzie, D. and Scott, K. 2008. Revisiting the relationship between mental health and poverty in developing countries: a response to Corrigall. *Social Science & Medicine*, 66(9), pp. 2064-2066.

Devenish, B., Hooley, M., & Mellor, D. (2017). The Pathways Between Socioeconomic Status and Adolescent Outcomes: A Systematic Review. *American Journal of Community Psychology*, forthcoming

Eibner, C., Sturn, R., & Gresenz, C. R. (2004). Does relative deprivation predict the need for mental health services. *Journal of Mental Health Policy and Economics*, 7(4), 167-175.

Fone, D., Greene, G., Farewell, D., White, J., Kelly, M. and Dunstan, F., 2013. Common mental disorders, neighbourhood income inequality and income deprivation: small-area multilevel analysis. *The British Journal of Psychiatry*, 202(4), pp.286-293.

Garvey, M.J. and Schaffer, C.B., 1994. Are some symptoms of depression age dependent?. *Journal of affective disorders*, 32(4), pp.247-251.

Gianaros, P.J., Horenstein, J.A., Cohen, S., Matthews, K.A., Brown, S.M., Flory, J.D., Critchley, H.D., Manuck, S.B. and Hariri, A.R., 2007. Perigenual anterior cingulate morphology covaries with perceived social standing. *Social Cognitive and Affective Neuroscience*, 2(3), pp.161-173.

Gove, W.R. and Tudor, J.F., 1973. Adult sex roles and mental illness. *American journal of Sociology*, pp.812-835.

Gureje, O., & Thornicroft, G. (2015). Health equity and mental health in post-2015 sustainable development goals. *The Lancet Psychiatry*, *2*(1), 12-14

Hopcroft, R. L., & Bradley, D. B. (2007). The sex difference in depression across 29 countries. *Social Forces*, *85*(4), 1483-1507Howe, L. D., Galobardes, B., Matijasevich, A., Gordon, D., Johnston, D., Onwujekwe, O., ... & Hargreaves, J. R. (2012). Measuring socio-economic position for epidemiological studies in low-and middle-income countries: a method of measurement in epidemiology paper. *International journal of epidemiology*, *41*(3), 871-886.

Jackson, B. and Goodman, E., 2011. Low social status markers: do they predict depressive symptoms in adolescence?. *Race and social problems*, 3(2), pp.119-128.

Kahneman, D., Krueger, A.B., Schkade, D., Schwarz, N. and Stone, A., 2004. Toward national well-being accounts. *The American Economic Review*, 94(2), pp.429-434.

Kass, R. E. and A. E. Raftery (1995), Bayes Factors, *Journal of the American Statistical Association*, 90, 430, 773-795

Kearns, A., Whitley, E., Bond, L., Egan, M. and Tannahill, C., 2013. The psychosocial pathway to mental well-being at the local level: investigating the effects of perceived relative position in a deprived area context. *Journal of epidemiology and community health,* 67(1), pp.87-94.

Kendler, K.S., Karkowski, L.M. and Prescott, C.A., 1999. Causal relationship between stressful life events and the onset of major depression. *American Journal of Psychiatry.*

Kendler, K.S., Kuhn, J. and Prescott, C.A., 2004. The interrelationship of neuroticism, sex, and stressful life events in the prediction of episodes of major depression. *American Journal of Psychiatry*. 161(4), 631-6

Kessler, R. C. (2012). The costs of depression. *The psychiatric Clinics of north America*, *35*(1), 1-14

Kessler, R. C., McGonagle, K. A., Swartz, M., Blazer, D. G., & Nelson, C. B. (1993). Sex and depression in the National Comorbidity Survey I: Lifetime prevalence, chronicity and recurrence. *Journal of affective disorders*, *29*(2), 85-96

Kleinman, A., Estrin, G. L., Usmani, S., Chisholm, D., Marquez, P. V., Evans, T. G., & Saxena, S. (2016). Time for mental health to come out of the shadows. *The Lancet*, *387*(10035), 2274-2275

Kolenikov, S., & Angeles, G. (2009). Socioeconomic status measurement with discrete proxy variables: Is principal component analysis a reliable answer?. *Review of Income and Wealth*, *55*(1), 128-165

Kuehner, C. (2003). Gender differences in unipolar depression: an update of epidemiological findings and possible explanations. Acta Psychiatrica Scandinavica, 108(3), 163-174

Laaksonen, E., Martikainen, P., Lahelma, E., Lallukka, T., Rahkonen, O., Head, J., & Marmot, M. (2007). Socioeconomic circumstances and common mental disorders among Finnish and British public sector employees: evidence from the Helsinki Health Study and the Whitehall II Study. *International Journal of Epidemiology*, *36*(4), 776-786

Laaksonen, M., Tarkiainen, L., & Martikainen, P. (2009). Housing wealth and mortality: a register linkage study of the Finnish population. *Social science & medicine*, *69*(5), 754-760

Lahelma, E., Laaksonen, M., Martikainen, P., Rahkonen, O., & Sarlio-Lähteenkorva, S. (2006). Multiple measures of socioeconomic circumstances and common mental disorders. *Social science & medicine*, *63*(5), 1383-1399

Layard, R., 2013. Mental health: the new frontier for labour economics. *IZA Journal of Labor Policy,* 2(1), p.1.

Linzer, M., Spitzer R. Kroenke K., Williams J.B., Hahn S., Brody D and deGruy F. (1996). Gender,quality of life and mental disorders in primary care: results from the PRIME-MD 1000 study. *American Journal of Medicine*., 101: 526-533

Luttmer, E.F., 2005. Neighbors as Negatives: Relative Earnings and Well-Being. The *Quarterly Journal of Economics*, pp.963-1002.

Lund, C., Breen, A., Flisher, A.J., Kakuma, R., Corrigall, J., Joska, J.A., Swartz, L. and Patel, V., 2010. Poverty and common mental disorders in low and middle income countries: a systematic review. *Social science & medicine*, 71(3), pp.517-528.

Marchand, Alain, Jaunathan Bilodeau, Andrée Demers, Nancy Beauregard, Pierre Durand, Victor Y. Haines III, Gendered depression: Vulnerability or exposure to work and family stressors?, *Social Science & Medicine*, Volume 166, October 2016, Pages 160-16

Marmot, M., 2005. Social determinants of health inequalities. *The Lancet*, 365(9464), pp.1099-1104.

McLaughlin, K.A., Costello, E.J., Leblanc, W., Sampson, N.A. and Kessler, R.C., 2012. Socioeconomic status and adolescent mental disorders. *American journal of public health*, 102(9), pp.1742-1750.

Mendelson, T., Kubzansky, L.D., Datta, G.D. and Buka, S.L., 2008. Relation of female gender and low socioeconomic status to internalizing symptoms among adolescents: A case of double jeopardy*?. Social Science & Medicine*, 6(66), pp.1284-1296.

Mirowsky, J. and Ross, C.E., 2001. Age and the effect of economic hardship on depression. *Journal of health and social behavior*, pp.132-150.

Mishra, S., & Carleton, R. N. (2015). Subjective relative deprivation is associated with poorer physical and mental health. *Social Science & Medicine*, 147, 144-149.

Moussavi, S., Chatterji, S., Verdes, E., Tandon, A., Patel, V., & Ustun, B. (2007). Depression, chronic diseases, and decrements in health: results from the World Health Surveys. *The Lancet*, *370*(9590), 851-858

Murray, C. J. L., & Lopez, A. D. (1996). The Global Burden of Disease. Geneva: World Health Organization, Harvard School of Public Health, World Bank.

Nolen-Hoeksema, S., Larson, J., & Grayson, C. (1999). Explaining the gender difference in depressive symptoms. *Journal of personality and social psychology*, *77*(5), 1061-1072

OECD Better Life Initiative, 2011. Compendium of OECD well-being indicators.

Pabayo, R., Kawachi, I., & Gilman, S. E. (2013). Income inequality among American states and the incidence of major depression. *Journal of epidemiology and community health, jech*-2013.

Patel, V., Chisholm, D., Parikh, R., Charlson, F. J., Degenhardt, L., Dua, T., ... & Lund, C. (2016). Addressing the burden of mental, neurological, and substance use disorders: key messages from Disease Control Priorities. *The Lancet*, *387*(10028), 1672-1685

Perraton, L. G., Kumar, S. and Machotka, Z. (2010), Exercise parameters in the treatment of clinical depression: a systematic review of randomized controlled trials. *Journal of Evaluation in Clinical Practice*, 16: 597–604.

Perugi, G., Musetti, L., Simonini, E., Piagentini, F., Cassano, G. B., & Akiskal, H. S. (1990). Gender-mediated clinical features of depressive illness. The importance of temperamental differences. *The British Journal of Psychiatry*, *157*(6), 835-841

Phanwar, I.A., Zia, S. and Rasool, M., 2014. Exploring the Personality traits as cause of compulsive Buying Behavior. *Journal of Business Strategies*, 8(2), p.19

Piccinelli, M., & Wilkinson, G. (2000). Gender differences in depression. *The British Journal of Psychiatry*, *177*(6), 486-492

Pollack, C. E., Chideya, S., Cubbin, C., Williams, B., Dekker, M., & Braveman, P. (2007). Should health studies measure wealth?: a systematic review. *American journal of preventive medicine*, *33*(3), 250-264

Radloff LS. CES-D scale: A self report depression scale for research in the general populations. *Applied Psychological Measurement* 1977, 1:385-401.

Rafful, C., Medina-Mora, M.E., Borges, G., Benjet, C. and Orozco, R., 2012. Depression, gender, and the treatment gap in Mexico. *Journal of Affective Disorders*, 138(1), pp.165-169.

Rai, D., Zitko, P., Jones, K., Lynch, J. and Araya, R., 2013. Country-and individual-level socioeconomic determinants of depression: multilevel cross-national comparison. *The British Journal of Psychiatry*, 202(3), pp.195-203.

Reiss, F., 2013. Socioeconomic inequalities and mental health problems in children and adolescents: a systematic review. *Social Science & Medicine*, 90, pp.24-31.

Richards, D., 2011. Prevalence and clinical course of depression: a review. *Clinical psychology review*, 31(7), pp.1117-1125.

Ríos, V., 2013. Why did Mexico become so violent? A self-reinforcing violent equilibrium caused by competition and enforcement. *Trends in Organized Crime*, 16(2), pp.138-155.

Rogers, W. H. 1993. sg16.4: Comparison of nbreg and glm for negative binomial. Stata Technical Bulletin 16: 7. Reprinted in Stata Technical Bulletin Reprints, vol. 3, pp. 82–84. College Station, TX: Stata Press.

Rössler, W., 2012. Stress, burnout, and job dissatisfaction in mental health workers. *European archives of psychiatry and clinical neuroscience*, 262(2), pp.65-69.Santor, D. A., Zuroff, D. C., Ramsay, J. O., Cervantes, P., & Palacios, J. (1995). Examining scale discriminability in the BDI and CES-D as a function of depressive severity. *Psychological Assessment*, *7*(2), 131

Sigmon, S.T., Pells, J.J., Boulard, N.E., Whitcomb-Smith, S., Edenfield, T.M., Hermann, B.A., LaMattina, S.M., Schartel, J.G. and Kubik, E., 2005. Gender differences in self-reports of depression: The response bias hypothesis revisited. Sex Roles, 53(5-6), pp.401-411.

Sweet, E. (2011). Symbolic capital, consumption, and health inequality. *American journal of public health*, *101*(2), 260-264

Tacoli, C., 2012. Urbanization, gender and urban poverty: paid work and unpaid carework in the city (p. 48). Human Settlements Group, International Institute for Environment and Development

Thornicroft, G., Chatterji, S., Evans-Lacko, S., Gruber, M., Sampson, N., Aguilar-Gaxiola, S., ... & Bruffaerts, R. (2017). Undertreatment of people with major depressive disorder in 21 countries. *The British Journal of Psychiatry*, 210 (2) 119-124

Tsai, A. C. (2014). Reliability and validity of depression assessment among persons with HIV in sub-Saharan Africa: systematic review and meta-analysis. *Journal of Acquired Immune Deficiency Syndromes (1999)*, *66*(5), 503-511

Van de Velde, S., Bracke, P. and Levecque, K., 2010. Gender differences in depression in 23 European countries. Cross-national variation in the gender gap in depression. *Social Science & Medicine*, 71(2), pp.305-313.

Yitzhaki, S. (1979), Relative Deprivation and the Gini Coefficient, *The Quarterly Journal of Economics*, 93 (2), 321-324.

Weissman, M. M., & Klerman, G. L. (1977). Sex Differences in the Epidemiology of Depression. *Archives of General Psychiatry*, 34, 98-11

WHO, 2017, Depression and Other Common Mental Disorders: Global Health Estimates. Geneva: World Health Organization

Wilsnack, R W, Wilsnck S C Kristjanson A F Vogeltanz N D and Gmel G (2009) Gender and Alcohol Consumption: Patterns for the Multinational Genacis Project, *Addiction*, 104 (9) 1487-1500

Zimmerman, F. J., & Katon, W. (2005). Socioeconomic status, depression disparities, and financial strain: what lies behind the income-depression relationship?. *Health Economics*, 14(12), 1197-1215