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The relationship between subjective well-being and self-reported health: evidence from Ecuador

Abstract: This article addresses the relationship between self-reported health and subjective well-being in two dimensions: cognitive and emotional. Using the Household Living Conditions Survey 2014, this study represents the first approach for Ecuador and Latin America to test how the two dimensions of subjective wellbeing explain self-reported health. The cognitive dimension is measured by a happiness question in a lifeevaluative mode. Whereas the emotional dimension is proxied by an average of sixteen psychosocial wellbeing questions that indicates how many, from the last seven days, the person had a poor emotional state. We use descriptive statistics and a probit model with an instrumental variable approach to address the omitted variables bias and reverse causality. After controlling for socioeconomic, personal, regional, and health related variables, the results indicate that happiness or the cognitive dimension of well-being is the main predictor of self-reported health, quantitatively more important than having a recent illness (objective health measure), habits (sport) or health care (health importance). Furthermore, more days in a negative emotional state is associated with worse self-reported health.

Keywords: subjective well-being; happiness; emotional; health; Ecuador; instrumental variable

1. Introduction

There is a growing literature explaining how subjective well-being (SWB) influences on health outcomes. Ong (2010) and Diener et al. (2017) review many ways that SWB affects mortality and health, such as healthy behavior, cardiovascular and immune system functioning. The relationship between SWB and self-reported health (SRH) is limited. Siahpush et al. (2008) argue that their study is the first on this topic. They found, in the case of Australia, that SWB is positively associated with future SRH (at wave 3). Sabatini (2014) found for Italy that feeling happy increases the probability of good SRH by 23%. There are no further studies on this topic. In this paper, we test how SWB influences on SRH in Ecuador, considering potential bias due to reverse causality.

Previous studies relate health objective measures such as life expectancy, longevity, and some medical diseases with happiness (a dimension of SWB). However, there is also strong evidence that associates SWB with subjective health measures. SRH appears to be more important than objective health measures because coping abilities and adaptation could offset potential losses in SWB due to poor health, but severe diseases indeed lower SWB (Diener et al. 1999). For instance, Angner et al. (2013) found that the association between health status and happiness depends on how health is measured. The results using subjective health measures were statistically significant, while using objective health measures were not. In the same vein, based on other studies, Veenhoven (2008) mentioned that the correlation of happiness with SRH is somewhat stronger than the correlations between happiness and health ratings based on medical examinations.

Over the last decades, the study of SWB became popular in social sciences and psychology since more surveys were available such as Gallup World Poll, World Values Survey, European Values and many other national surveys. According to Diener et al. (2003), SWB includes cognitive and emotional evaluations of people's lives. Cognitive refers to life satisfaction (life as a whole), whereas emotional relates to emotions, feelings or moods. Steptoe et al. (2015) identify three groups: (i) evaluative well-being that alludes to life satisfaction, (ii) hedonic well-being that refers to positive affect and negative affect and (iii) eudemonic well-being that is the sense of purpose and meaning in life. In OECD (2011) and OECD (2013), emotional well-being is expressed as positive affect (happiness, excitement, joy) and negative affect (anger, pain, sadness, etc.). By construction, SWB dimensions are conceptually distinct, but they might be correlated with each other. For instance, Kanheman and Krueger (2006) found for Germany that the correlation between net affect[1] and life satisfaction is 0.38. OECD (2013), using Gallup World Poll across countries, shows that life satisfaction is correlated with (i) positive affect (0.23) and (iii) negative affect (-0.23).

Bjornskov (2003) and Frey and Slutzer (2002) use happiness and life satisfaction interchangeably; while Veenhoven (2012) describes happiness, as how much one likes the life one leads, and then suggest life satisfaction and happiness are synonymous. Conversely, Deaton (2008) remarks that in questions about life satisfaction, respondents make an overall evaluation of their lives based on thoughts, whereas happiness also refers to affect, and ask for experiences such as smiling, feeling happy and absence of depression some days before the interview. In this sense, Kimball and Willis (2006) remarks that happiness is the sum of two components: (i) short-term, which depends on recent events in life, and (ii) long-term, which depends on aspects such as entertainment, health or nutrition. Life satisfaction is usually measured by asking people to rate their current life in scale from 0 (worst possible life or completely dissatisfied) to 10 (best possible life or completely satisfied), whereas happiness is usually measured with the question "taken all together, would you say that you are very happy, pretty happy, or not too happy". When comparing answers from happiness questions with life satisfaction questions, there is no significant difference (Helliwell and Putnam 2004 and Helliwell et al. 2012).

With regard to self-reported health (SRH), it is a very frequently health measure used in social sciences derived from a questionnaire in which the person - based on perceptions- rates their health. It is an easy and fast way to collect reliable information about health, especially in cases where objective data are insufficient to reflect disease severity or in cases with undiagnosed disease. In general, morbidity measures rely on specific external observations for each type of disease, while in other cases such as pain or discomfort, subjective evaluation of health is the only valid source of information that even could coincide with objective measures (Lora 2011).

Jylhä (2009) suggests that the mechanism of SRH is a cognitive process, which is subjective and circumstantial, based on the biological and psychological state of the person; it might predict mortality rate. Indeed, SRH has proven to be associated with mortality rate (Mossey and Shapiro 1982; Idler and Benyamini 1997; Benyamini and Idler 1999; Idler et al. 2000; Murata et al. 2006). Besides, SRH is consistent with the objective health status measured by examining the prevalence of diseases and laboratory parameters (Wu et al. 2013), life expectancy (Bourne 2009), risk factors, disease indicators (Kaplan

[1] Net affect results from the difference between positive and negative episodes. See Kahneman and Kruger (2006, p. 11).

1996) and walking difficulty (Jylhä et al. 2001). Au and Johnston (2014) found that the strongest predictor of SRH is vitality and, then, physical functioning and bodily pain.

Despite several findings relating SRH with objective health measures, SRH has not been exempt from critics. According to Sen (2002), in India, a person who arrives to a community with many diseases and few health facilities would consider their symptoms normal when they are clinically preventable, while people with more education and access to better health facilities are in a better position to diagnose and perceive their own health than people who live in disadvantaged places. However, Subramanian et al. (2009) with data from India found that people with lower education are more likely to report some diseases and poor health status than those with higher levels of education. They conclude the skepticism in the use of self-reported health has little empirical support. Another critic is Huisman and Deeg (2010), who argue that SRH could not be considered as a true measure of health status, but only as a perception of health. In response, Jylhä (2010) argued that in medicine, the state of health is usually approached with diagnoses, laboratory values, functional tests, etc., but there is no rule or equation that encompasses all dimensions into a single indicator of health.

SWB does not cure diseases, but it seems to protect from getting sick in some way (Veenhoven 2008). Pressman and Cohen (2005) reviewed several papers that show the connection between positive affect with: (i) lower morbidity, fewer symptoms and pain, (ii) increase in longevity and (iii) acceleration in immunological, cardiovascular and pulmonary functions. There is a mature literature that explains how SWB dimensions influences on health; Diener et al. (2017) on its appendix shows a very large review of studies that explains how SWB influences on health, for instance in terms of health behavior, speed of recovery, immune, improved cardiovascular health, reduce inflammation, survival and longevity. For short-term outcomes, SWB is correlated with immune functioning, while for long-term outcomes SWB is associated with cardiovascular health and longevity (Howell et al. 2007). Emotional state might contribute to vulnerability of cardiac dysfunction in everyday life (Bhattacharyya and Steptoe, 2011), positive affect is associated with stronger immune system, for instance lowering the risk of developing a cold (Cohen et al. 2003), or reducing neuroendocrine, inflammatory and cardiovascular activity (Steptoe et al. 2005). Whereas negative affect is a reliable predictor of heart rate (Daly et al. 2010), related to blood pressure (Ilies et al. 2010). Even clinical depression is associated with lower levels of SWB (Gargiulo and Stokes, 2009), and depression predicts the development of coronary heart disease (Rugulies, 2002)

Sabatini (2014) based on other studies mention that the main channel of transmission explaining how SWB impacts on health is the autonomic nervous system (ANS) since attitudes towards life prevent the ANS from activating physiological reactions that determines health. Happy people are motivated to act healthy, for instance exercising and not smoking (Boehm et al. 2012; Grant et al. 2009), eating a healthy diet (Blanchflower et al. 2013) and having lower levels of body max index (Hamer and Chida 2011). Conversely, people with poor SWB are related to destructive behaviors that can worsen health problems, for example persons with anxiety or depression are likely to be obese, to smoke, and drink alcohol (Strine et al. 2008) or having more insomnia symptoms (Hamilton et al. 2007). Receiving bad news or having a poor perception of life could worsen the state of health due to stress caused by adverse life changes (Martinson et al. 1985).

According to Sabatini (2014), three common concerns when dealing with the relationship between SWB and SRH are (i) reverse causation, (ii) health objective omitted variables such as suffering certain diseases and (iii) individual exogenous shocks that affect both variables and creates a common bias. To deal with these complications, the author uses an instrumental variables approach; he found that happiness is the strongest predictor of SRH. In this paper, we also use instrumental variables, but we include a health objective variable that captures if the person had a recent illness.

On the other hand, there is a bunch of literature going from health to SWB. Health problems that interfere with daily activities affect happiness (Mukuria and Brazier 2013). Graham et al. (2011) found that anxiety, pain/discomfort are associated with lower happiness. There are several studies using SRH instead of objective health measures. On average, people with a better perception of health would score a high value of SWB compared to those with a poor perception of health. Palmore and Kivet (1977) found that initial levels of SRH was the most critical factor that influenced future life satisfaction. Angner et al. (2013) found a positive correlation between happiness and SRH in older adults. Helliwell (2003) estimated that an increase in one unit of health on a five-point scale is associated with a 0.61-point increase in SWB. Ljunge (2016) found that SRH is a crucial determinant of individual well-being, quantitatively much more important than other demographic and economic characteristics. Mizobuchi (2017) recommends that health should be the highest priority for improving happiness motivated by the fact that in a sample of 36 developed countries, health factors account for the largest part of the cross-country variation in SWB. Graham (2012) for Latin America found that when explaining happiness, SRH has the strongest coefficient.

2. Data, Variables and Method

Ecuador Living Conditions (ECV) 2014 is a cross-sectional nationwide (urban-rural) survey that contains information of different aspects and dimensions of life and welfare such as income, expenditure of family units, own production, health, education, habits, and social capital, among others. For the first time, this survey includes SWB questions in their questionnaire; SWB is measured in terms of cognitive and emotional dimensions. The cognitive or evaluative dimension of SWB is measured by the question "In a scale of 1 to 10, meaning 1 completely unhappy and 10 completely happy, how do you feel taking into account all aspects of your life. This question asks for happiness in a life-evaluative mode. In the following results we will refer to as happiness. The emotional well-being is measured through the average of the 16 questions of psychosocial well-being in scale of 0 to 7 (*see Table 1 –Appendix- for the description of the variables*). Each question ask how many days from the last seven days the person had a negative mood such as depressed, poor selfesteem, upset, among others; thus, the higher is the value, more days in a negative emotional state the person has been (poor emotional well-being). On the other hand, SRH is measured by the question "In a scale of 1 to 10, meaning 1 completely unsatisfied and 10 completely satisfied, how do you feel about your health status?".

Table 2 shows the summary and description of questions from the survey used to model SWB and SRH. Table 3 presents descriptive statistics for SRH; Panel A shows bivariate statistics for ordered variables, computing the mean for each category, and the Goodman and Kruskal's Gamma (ϒ) statistic (it is a measure of association between categorical variables). Happiness is positively associated with SRH, which means that if one person has better SRH than another we would expect that person to report higher level of happiness. As well as if a person has low level of happiness, we expect this person to report poor SRH[2]. The association between these variables is the highest among all variables. The relationship between SRH and income perception is negative, which indicates a person that considers his income poor to live would report worse SRH than a person that considers his income good to live. As education increases, people report higher SRH. On the other hand, there is no pattern with age and health importance.

Panel B (Table 3) indicates the results of a difference mean test for binary variables; people that have not experienced illness and practiced any sport in the last month report on average less SRH than people that experienced illness and did not practice any sport. Panel C (Table 3) indicates that people that report high SRH had fewer days in the negative emotional state. Conversely, people that report low SRH had more days in a negative emotional state. Furthermore, in Figure 1 (Appendix) is shown the relationship between SWB and SRH; the database is collapsed by means into cities to facilitate visualization. This Figure indicates that SRH is positively correlated with happiness (cognitive dimension in Figure 1A) and negatively correlated with emotional well-being (emotional dimension in Figure 1B) in concordance with the previous evidence.

A common concern when measuring SWB is that people use the response categories differently (Kahneman and Krueger, 2006), or that answers might be weighted with judgment and affect (Diener et al. 2009). A plausible approach is to use a binary variable, =1 if happy and =0 if unhappy. For instance, in Sabatini (2014), happiness is measured on a scale from 1 to 10, the cutoff-point is 8, and then a person is happy if the response is equal or greater than 8, and 0 otherwise. When modeling SRH as a dependent variable, some alternatives could be considered. The first, assuming that health is an unobservable latent variable normally distributed and an ordered outcome, the most common approach is to estimate an ordered probit/logit model as Graham (2012). Another alternative is to use a Log-Normal OLS because of the distribution of SRH could be skewed, since most people in the sample report good health with high concentration at the end of the scale. To ensure skewed distribution in the right direction Cubí-Mollá et al. (2014) and Cubí-Mollá and Herrero (2012) SRH is inverted as i = 11 − SRH, which is closer to a standard log-normal distribution.

Despite SRH is an ordinal variable; we do not use an ordered model because the interpretation is complicated, considering a scale with 10 points. Alternatively, we use a probit model with a dummy variable indicating good health that equals 1 if SRH is equal or greater than 7 and 0 otherwise. This cutoff was selected, considering the mean of SRH is 6.8. Using this same rule, we transform the independent variables happiness and emotional well-being into dummy variables. The mean of happiness is 7.6, and emotional well-being is 1.1 (see Table 2). Because the data comes from a cross-sectional survey, it is not possible to isolate for endogeneity: (i) potential unobservable variables and (ii) reverse causality that could bias the estimation. As a solution for endogeneity, we use a probit model using instrumental variables. The general set up is:

$$h_{1i}^{*} = \beta s_i + \delta e_i + x'_{1i}\,\gamma + \varepsilon_i \qquad (1)$$

$$s_{2i} = \delta e_i + x'_{1i}\,\pi_1 + c\pi_2 + v_i \qquad (2)$$

[2] In Goodman and Kruskal's Gamma (ϒ) statistic is not defined which variable is dependent or independent.

where: $i = 1, \ldots \ldots N;\ h^*_{1i}$ is a latent binary variable, equals 1 if a person has good health status and 0, otherwise; s_i = represents happiness, and e_i represents the emotional well-being; x'_{1i} is a vector of additional explanatory variables; c is the instrument Sense of Community (SoC), that equals 1 if the person feels part of its community and equals 0 otherwise. Equation 1 is called "structural" and equation 2 is referered to as "first-stage" or "reduced-form". The reduced-form explains the variation of happiness in terms of exogenous variables, including the instrument. Indeed, the instrument should hold the relevance condition, which means that it should be correlated with happiness. Conceptually, SoC "reflects the feelings of attachment and belonging that an individual has towards a community" (Pooley et al. 2005, pp.71). Pooley et al. (2005) argue that SoC allows an understanding of how the person connects to the community, which is a key aspect of the concept of social capital[3]. There is a bunch of literature that explains how social capital dimensions (trust and obligations, information channels, norms and sanctions) are correlated to happiness and life satisfaction. Wakefield et al. (2017) is the first study to explore how the sense of commonality with the group's members is related to life satisfaction. They found higher levels of identification with the local community predicts higher levels of life satisfaction, and this effect is highly statistically significant at 1% level. In the reduced form, we will test the correlation between SoC and happiness and perform the test of weak instrument.

Moreover, the instrument should hold the exogeneity condition, which means the instrument should not be correlated with the error term of the structural equation. Carpiano and Hystad (2011) argue the connection from SoC to SRH is to know people well to ask them for favors. We consider that in Ecuador this is not a concern since public free healthcare reduces health disparities and declines the effect of social capital to determine health. In 2014 out of 32 countries of Latin America & Caribbean, health expenditure as a percentage of GDP in Ecuador was 8.64%[4], the second highest indicator in the region. We use a very similar argument to Sabatini (2014) who tests whether happiness affects SRH for the province of Trento in Italy. He uses social capital variables (quality of friends and social trust) as instruments. The author remarks for their study the exogeneity condition holds since the public healthcare system scales down the role of social capital in facilitating access to healthcare services. In the results section, we discuss the exogeneity of the instrument using the Wald test of exogeneity.

3. Results

Table 4 shows a simple probit model. Column 1 reports the influence of feeling happy raises the probability of reporting good SRH by 27.3%, controlling for personal, education, work and subjective economic well-being variables, whereas emotional well-being has no statistically significant effect. More educated people, with a job and with better subjective income perception, are more likely to report good SRH, which might indicate health disparities by socioeconomic status. Column 2 controls additionally for health variables such as recent illness, practicing sport and health importance; the effect slightly decrease to 26.8%. This might indicate happiness predicts much more SRH than any other variable, even than objective health measure; having a recent illness decreases the probability of declaring good SRH by 9.6%. Column 3 includes SoC as a control variable; feeling part of the community does not have any significant influence on SRH. This is crucial because SoC could be exogenous to other health determinants contained in the error term of the structural equation in the following instrumental variable estimation.

Table 5 indicates the estimation of the probit model using SoC to solve for reverse causality (IV Probit). Column 1 reports the results of the first-stage, indicating SoC explain happiness; the coefficient is significant at 0.01, which suggests that SoC holds the relevance condition. Column 2 reports the result of the instrumental variables estimation; feeling happy increases the probability of having good SRH by 37.7%. As in the simple probit model (Table 5), people with better income perception and who did not experienced an illness in the last month report greater probability of good SRH; the reason could be that people with better income perception have better habits and take care of their health, so they experienced less illness and, then, report high SRH. Furthermore, we find that married people declare higher SRH than non-married. There are two plausible reasons. First, marriage selection theory means that healthier individuals are more likely to get married and to stay married, whereas the less healthy people remain single or are likely to become divorced or widowed (Goldman, 1993). Second, and more convincing, is marriage protection by which marriage protects against adverse health outcomes since the tie reduces risky behavior and increase preventive behavior (Broman, 1993). At regional level, Coast Region has worse SRH than Highlands Region; this might be due to individuals in Coast Region report more illness and have a poorer

[3] According to Paxton (1999, p.89.) "Social capital is the idea that individuals and groups can gain resources from their connections to one another (and the type of these connections)".

[4] According to World Health Organization / Global Health Expenditure Data Base
http://apps.who.int/nha/database/Select/Indicators/en

income perception than persons in Highlands Region, besides the fact that epidemiological profile varies across region due to weather, altitude and cultural aspects.

The coefficient of age is positive, and the coefficient of age squared is negative, indicating a marginal decreasing effect of age on having a good SRH. For people younger than 40 years SRH is 7.1, whereas SRH for older than 40 is 6.4. Idler (1993) outlines the debate in gerontology literature around the relationship between SRH and age. As age increases, people are exposed to aches, pains, and physical discomfort, and they might tend to exaggerate their health as poor, but people might also perceive these symptoms as normal signs of aging, and they might be optimistic about their health. The author finds a positive relationship between age and SRH.

A critical concern in our study is the validity of the instrument SoC. First, the instrument should be relevant. In Table 5, we test in the first-stage that SoC does explain happiness, which gives the idea that instrument is reasonable in terms of relevance. An instrument is refered to as weak when it does not hold the relevance condition. The problem is when using a weak instrument, the instrumental variable estimator is biased and the hypothesis test has large size distortions (Stock and Yogo 2005). To ensure the instrument is not weak, we use the Stock and Yogo test; the minimum eigenvalue statistic is 116.79 that greatly exceeds the critical value of 16.38 for a 5% confidence level. Then, we reject the null hypothesis of a weak instrument in favor to the alternative hypothesis, thus SoC is a relevant instrument. Secondly, the instrument should be exogenous. As shown in Table 4, SoC is not correlated with reporting good health, which gives the first idea that the instrument might be exogenous. We use the Wald test of exogeneity that accounts for whether the error terms in the structural equation and the reduced-form equation for the endogenous variable are correlated. The Wald test of exogeneity has a p-value of 0.28, which is weak evidence against the null hypothesis that happiness is exogenous.

Table 6 shows the same probit and IV probit model, but using illness the only objective health measure in the survey as the dependent variable. Illness equals one if the person had a recent illness (objective health measure). Column 1 shows for the simple probit model that SoC does not explain illness. Therefore, we confirm again that our instrument is exogenous since it is not related to any subjective or objective health outcome. The results of the second stage indicate that the effect of happiness on illness is not statistically significant. This result seems similar to Angner (2013), who found the correlation between happiness and objective health measures were not statistically significant, but the correlation was significant using subjective health measures.

To validate previous results, we use ECV (2014), in Table 7 to test the same relationship between SRH and happiness using a 2013-2014 panel data from the National Survey of Employment, Unemployment and Underemployment (ENEMDU). We use a probit model allowing for fixed effects to control for unobserved individual characteristics that could bias the estimation. We use the same variables than previous estimates except for SoC, sport, emotional well-being and health importance that were not available in ENEMDU. As expected, using fixed effects, regional and racial minority variables are omitted. The result indicates happiness does explain SRH; the coefficient is 53%, somewhat greater than the IV Probit model using ECV (2014) shown in Table 5.

To complement the understanding of the relationship between SWB and SRH, we use a Structural Equation Model (SEM) that allows for path analysis and simultaneous equations modeling. Friedman (2019) remarks that the absence of causal models might yield puzzling results; this occurs because the causal pathways are not as is usually expected. For instance, several studies argue that depression and/or anxiety affect health, but some specific diseases, infections or injuries are accompanied by depression and anxiety. Pressman et al. (2019) present two theoretical models to describe how positive affect influences on health. The first model states that health behaviors and health-relevant physiological changes are the path from positive affect to health outcomes. The second model explains how positive affect reduces stress and its damaging effects on the body; hence it improves health. In the first stage, positive affect moderates the effect between stress and health. In the second stage, positive affect reduces the occurrence of stress and leads to healthier behavior and physiological changes. Finally, stress mediates the effect between positive affect and health.

The main idea in this paper is to establish a causal model of how predictor variables are combined to affect SRH. The best-fitting SEM model[5] for our case considers SRH and happiness as endogenous variables. The exogenous variables are emotional well-being, illness, health importance, sport, age, education work and SoC, as shown in Figure 2. In Table 8 we present the SEM estimate; panel A indicates the direct effects on SRH on happiness, and panel B indicates the indirect effects on SRH. We found that happiness mediates the relationship between sport (habits) and SRH. It would have been more coherent that our emotional well-being measure, or any of its 16 variables, mediate this relationship, which would be closer to Pressman (2019); however, with our data, all of these specifications yield a poor fit. This might occur because our

[5] The root mean square error of approximation (RMSEA) is 0.027, the comparative fit index (CFI) is 0.95, and the standardized root mean squared residual (SRMR) is 0.008. All of these goodness of fit tests indicate a close fit model.

measure of emotional well-being captures negative affect rather than positive affect as in Pressman (2019). Besides, considering that we use cross sectional data we cannot observe the duration of emotional well-being; it would be expected that only long-term emotions predict health outcomes. In our best-fitting model, emotional well-being does not explain SRH, which is entirely consistent with our instrumental variable regression.

Age, illness and health importance exhibit a negative correlation with SRH. We would have expected that age mediates the relationship between illness and health importance with SRH. As age increases, people tend to have more illness, and they give higher importance to health; thus, they report low SRH. We tried the specification going from age to illness, then illness to health importance and, finally, health importance to SRH. The direct and indirect effects of this specification were significant; nonetheless, the SEM model yields just an acceptable fit.

The indirect effect of education on SRH is significant. Graham (2008) argues that education is likely to mediate the relationship between happiness and SRH. More educated people are, on average, happier, and education contributes to preventive health attitudes that affect health outcomes. We tried a specification going from education to health importance, and health importance to SRH. The effect of education on health importance was significant, as well as the indirect effect of education on SRH, although the model yields just an acceptable fit[6].

The SEM analysis contributes to understand better the possible paths between SWB and SRH. Based on our best-fit model, we confirm a positive relationship going from happiness to SRH and the null association between emotional wellbeing and SRH. Considering that the covariance between both error terms is significant, the SEM analysis might not be interpreted as exempt from common bias.

4. Conclusions

Health is instrumental to many aspects of person's lives such as working, training, education and participating in social activities. A person with a good health status might do better on all these aspects compared to a person with poor health status. One of the most common measures in social sciences to measure health is by self-reported health (SRH) that encompasses an overall measure of health based on people's perceptions. Previous research found evidence that health status is highly correlated with cognitive (evaluative) and emotional well-being dimensions. When dealing with the relationship between SRH and SWB there are two logics of causality; one possibility is that people report high SWB because of their good health. While another alternative, based on medical and psychological findings, connects SWB to health. Using the Household Living Conditions Survey 2014 for Ecuador, we estimate the effect of cognitive and emotional well-being on SRH using the sense of community (SoC) as an instrumental variable to solve for reverse causality.

The results indicate happiness or the cognitive dimension of well-being is the main predictor of SRH, quantitatively more important than having a recent illness (objective health variable), habits (sport) or health care (health importance), likewise income perception and marital status also explain SRH; while emotional well-being does not predict SRH. Despite solving for reverse causality, the results of this study, which uses mainly cross sectional data, should not be interpreted as causal relation. In some cases, health variations occur over long periods, therefore in absence of a long panel data, we cannot argue that SWB has a causal effect on health status.

This study is the first evidence that associates the two dimensions of SWB to explain SRH for Latin America and Ecuador. Unlike the only previous studies (Siahpush et al. 2008 and 2014), we test whether happiness and emotional well-being affect SRH rather than only happiness. Our results are entirely new since, in general, health policy in Ecuador rarely considers the potential spillovers. We suggest that in addition to public free healthcare policy, health outcomes might improve by increasing SWB. For future research to reinforce our results, it would be needed to test whether various dimensions of SWB affect specific health outcomes such as cardiovascular indicators, immune indicators, healthy behavior, etc. Methodologically, either manipulating SWB experimentally or using longitudinal data; however, in Latin America SWB variables are usually missing in health surveys.

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[6] The results from models with poor or acceptable fit are available upon request from the authors.

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Research Data Policy

Data is deposited at Acosta-González, Hugo Nicolás, 2019, "National Survey of Employment, Unemployment, Underemployment (ENEMDU) 2013-2014", https://doi.org/10.7910/DVN/JVPMBM, Harvard Dataverse, DRAFT VERSION

Appendix

Figure 1: Self-reported health and subjective well-being

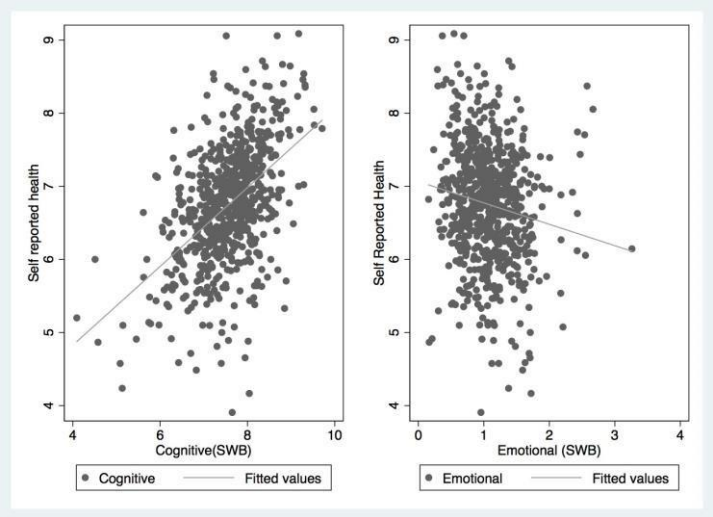

Table 1: Description of psychosocial well-being questions used to calculate emotional dimension of well-being

ariable	Description	V
1	In the last 7 days how many days have you feel upset for things that usually would not bother you?	
2	In the last 7 days how many days have you not have appetite?	
3	In the last 7 days how many days you could not stop crying even with friends or family support?	
4	In the last 7 days how many days you could not concentrate even when nobody was interrupting?	
5	In the last 7 days how many days have you feel depressed?	
6	In the last 7 days how many days have you feel that everything you did was a sacrifice?	
7	In the last 7 days how many days have you feel that your life is a failure?	
8	In the last 7 days how many days have you feel fear?	
9	In the last 7 days how many days have not get enough sleep?	
10	In the last 7 days how many days have speak less than usual?	
11	In the last 7 days how many days have you feel alone?	
12	In the last 7 days how many days have that people were not friendly?	
13	In the last 7 days how many days have you cried?	
14	In the last 7 days how many days have you sad?	
15	In the last 7 days how many days have you feel people did not like you?	
16	In the last 7 days how many days have you do want to do nothing?	

Table 2: Summary statistics

Variable	Description	Mean	Std. Dev.
Happiness	in scale of 1 to 10	7.657	1.503
Emotional Well-Being	average number of days	1.113	0.0038
Self-Reported Health	in scale of 1 to 10	6.888	19492
Age	in years	34.435	9.998
Age Squared	in years	1285.77	761.037
Male	=1 if men, =0 otherwise	0.586	0.492
High School	=1 if graduated from high school, =0 otherwise	0.444	0.496
Racial Minority	=1 if is indigenous or black, =0 otherwise	0.247	0.431
College	=1 if graduated from college, =0 otherwise	0.252	0.434
Martial Status	=1 if married or free union, =0 otherwise	0.654	0.475
Home Activities	number of hours in home activities per week	13.885	11.464
Working	=1 worked at least one hour last week=1, =0 otherwise	0.704	0.456
Labor Stability	=1 if has a permanent work , =0 otherwise	0.595	0.120
Good Income Perception	=1 if report good living status with actual income, =0 otherwise	0.182	0.387
Acceptable Income Perception	=1 if report acceptable living status with actual income, =0 otherwise	0.762	0.426
Poor Income Perception	==1 if report poor living status with actual income, =0 otherwise	-	-
Illness	=1 if had an illness last month (non-ARI nor-ADD), =0 otherwise	0.430	0.495
Health Importance	in a scale of 1 to 4 (1=very, 4=none) 4=nothing	1.119	0.335
Sport	=1 if practiced any sport last month, =0 otherwise	0.481	0.481
Region 1	=living in Highlands Region, =0 otherwise	-	-
Region 2	=living in Coast Region, =0 otherwise	0.290	0.453
Region 3	=living in Amazon Region, =0 otherwise	0.124	0.330
Region 4	=living in Galápagos Region, =0 otherwise	0.042	0.200
Sense of Community	=1 if feels part of the community, =0 otherwise	0.878	0.327

Table 3: Descriptive Statistics

A	B	C

Ordered Data	
Happiness	mean (SRH)
1 (very unhappy)	5.897
2	5.571
3	5.467
4	5.685
5	5.958
6	6.377
7	6.857
8	7.423
9	8.001
10 (very happy)	8.222
$\Upsilon = 0.2785$	
Age	mean (SRH)
<20 (1)	6.998
20-34 (2)	7.139
35-49 (3)	6.480
50-64 (4)	7.065
>65 (5)	5.883
$\Upsilon = 0.086$	
Education	mean (SRH)
< High School (1)	7.167
High School (2)	7.429
>High School (3)	7.643
Υ= -0.090	
Income Perception	mean (SRH)
Good Income (1)	8.1395
Acceptable Income (2)	7.3245
Poor Income (3) *Υ= -0.2008*	6.0474
Health Importance	mean (SRH)
Very Important (1)	7.438
Important (2)	7.167
Somewhat Important (3)	5.889
Nothing Important (4) *Υ= -0.0512*	7.001
Region	mean (SRH)
Highlands	7.481
Coast	7.125
Amazon	7.505
Galápagos	8.017

Binary variables	
Sex	mean (SRH)
Male (1)	7.374
Women (0)	7.424
t-statistic = -1.0496	
Pr(0-1 ≠ 0)=0.29391	
Marital	mean (SRH)
Married (1)	7.050
otherwise (0) t-statistic = -1.2651	7.590
Pr(0-1 ≠ 0)=0.2059	
Work	mean (SRH)
at least one hour last week (1)	7.170
otherwise (0)	7.408
t-statistic = -1.4969	
Pr(0-1 ≠ 0)=0.1345	
Labor Stability	mean (SRH)
has a permanent job (1)	7.373
otherwise (0)	7.424
t-statistic =-1.0708	
Pr(0-1 ≠ 0)=0.2824	
Illness	mean (SRH)
had an illness last month (1)	7.064
otherwise (0)	7.638
t-statistic =12.1589	
Pr(0-1 ≠ 0)=0.000	
Sport	mean (SRH)
practiced any sport last month(1)	7.276.411
otherwise (0)	7.539.735
t-statistic =5.6191	
Pr(0-1 ≠ 0)=0.000	

Emotional Well-Being	
	SRH mean (emotional)
1	1.253
2	1.223
3	1.223
4	1.221
5	1.284
6	1.082
7	1.046
8	0.954
9	0.915
10	0.926

t-statistic and Pr() correspond to difference of means test

values in parenthesis for indicate the order category

Goodman and Kruskal's Gamma (ϒ)

Table 4: Probit estimation (dependent variable SRH)

	Model 1	Model 2	Model 3	Model 4
Happiness	0.273***	0.268***	0.267***	0.267***
	(52.14)	(47.11)	(47.03)	(46.91)
Emotional Well-Being	0.0187*	0.192	0.190	0.191
	(2.42)	(1.18)	(1.16)	(1.17)
Age	0.000638	0.00517***	0.00525***	0.00526***
	(0.74)	(4.60)	(4.67)	(4.68)
Age Squared	-0.0000516***	-0.000102***	-0.000103***	-0.000104***
	(-4.88)	(-6.97)	(-7.04)	(-7.06)
Male	0.0133**	-0.00163	-0.000851	-0.000875
	(2.62)	(-0.28)	(-0.15)	(-0.15)
High School	0.0489***	0.0399***	0.0388***	0.0390***
	(10.34)	(8.16)	(7.92)	(7.95)
University	0.0996***	0.0816***	0.0798***	0.0799***
	(12.99)	(10.26)	(10.03)	(10.05)
Racial Minority	0.0284***	0.0306***	0.0268***	0.0270***
	(5.59)	(5.59)	(4.79)	(4.84)
Marital Status	0.0854***	0.0880***	0.0878***	0.0879***
	(17.08)	(16.82)	(16.78)	(16.80)
Home Activities	0.000476**	0.000535**	0.000541**	0.000540**
	(2.81)	(2.94)	(2.98)	(2.97)
Work	0.00639	0.0127*	0.00999	0.00987
	(1.30)	(2.37)	(1.85)	(1.83)
Good Income	0.260***	0.244***	0.237***	0.237***
	(29.86)	(25.74)	(24.87)	(24.86)
Acceptable Income	0.132***	0.120***	0.118***	0.117***
	(18.64)	(15.63)	(15.24)	(15.22)
Illness		-0.0963***	-0.0951***	-0.0951***
		(-21.91)	(-21.60)	(-21.60)
Health Importance		-0.0509***	-0.0494***	-0.0494***
		(-8.79)	(-8.52)	(-8.52)
Sport		0.0408***	0.0389***	0.0388***
		(8.36)	(7.92)	(7.91)

SoC				0.00702 (1.07)
Region 2			-0.0209 ***	-0.0211 ***
			(-4.19)	(-4.22)
Region 3			-0.0163*	-0.0164**
			(-2.57)	(-2.59)
Region 4			0.0826***	0.0820***
			(5.45)	(5.41)
N	56137	47808	47808	47808

*t statistics in parentheses * p<0.05, ** p<0.01, *** p<0.001*

Table 5: IV Probit Estimation (dependent variable SRH)

	First-Stage	IV
Self-Reported Health	0.161***	
	(45.99)	
Happiness		0.377***
		(3.94)
Emotional Well-Being	-0.0972	0.196
	(-0.85)	(1.24)
Age	0.000215	0.00490***
	(0.25)	(4.28)
Age Squared	0.00000977	-0.0000984***
	(0.86)	(-6.49)
Male	-0.00966*	0.000371
	(-2.15)	(0.07)
High School	0.0315***	0.0328***
	(8.14)	(4.43)
University	0.0889***	0.0666***
	(12.27)	(4.54)
Racial Minority	-0.0214***	-0.0229***
	(-5.11)	(-3.48)
Marital Status	0.0256***	0.0797***
	(6.32)	(8.33)
Home Activities	-0.000373**	0.000559**
	(-2.64)	(3.17)
Work	-0.0178***	0.0118*
	(-4.27)	(2.17)
Good Income	0.153***	0.202***
	(20.96)	(5.91)

Acceptable Income	0.0971***	0.0949***
	(19.35)	(4.18)
Illness	-0.00890*	-0.0885***
	(-2.55)	(-11.11)
Health Importance	-0.0139**	-0.0447***
	(-3.22)	(-6.12)
Sport	0.0172***	0.0347***
	(4.40)	(5.52)
Sense of Community	0.0501***	
	(10.42)	
Region 2	0.0342 ***	-0.0243 ***
	(8.73)	(-4.35)
Region 3	0.00498	-0.0161**
	(1.03)	(-2.62)
Region 4	0.0981***	0.0695***
	(6.43)	(3.61)
N	47808	47808

*t statistics in parentheses * p<0.05, ** p<0.01, *** p<0.001*

Table 6: IV Probit Estimation (dependent variable SRH)

	Probit	IV Estimation	
	Estimation	First-Stage	IV
Happiness	-0.0407***		-0.186
	(-7.01)		(-1.72)
Emotional Well-Being	-0.00463	-0.0798	-0.0194
	(-0.03)	(-0.71)	(-0.13)
Age	0.00350**	0.00118	0.00360**
	(3.06)	(1.34)	(3.21)
Age Squared	0.0000456**	-0.00000776	0.0000426**
	(3.05)	(-0.67)	(2.86)
Male	-0.0537***	-0.0100*	-0.0536***
	(-9.12)	(-2.18)	(-9.16)
High School	-0.0178***	0.0396***	-0.0115
	(-3.53)	(10.00)	(-1.66)
University	-0.0384***	0.107***	-0.0246
	(-4.72)	(14.50)	(-1.83)
Racial Minority	-0.00000589	-0.0259***	-0.00389
	(-0.00)	(-6.01)	(-0.63)
Marital Status	-0.0209***	0.0413***	-0.0141
	(-3.89)	(9.97)	(-1.89)
Home Activities	0.000182	-0.000295*	0.000129
	(0.98)	(-2.04)	(0.69)
Work	0.0295***	-0.0176***	0.0258***

	(5.33)	(-4.11)	(4.13)
Good Income	-0.0978***	0.197***	-0.0637*
	(-10.16)	(26.61)	(-2.20)
Acceptable Income	-0.0549***	0.120***	-0.0309
	(-7.26)	(23.14)	(-1.51)
Ilness		-0.0257*** (-7.22)	
Health Importance	0.0204 ***	-0.0227 ***	0.0163 *
	(3.47)	(-5.15)	(2.42)
Sport	0.0101*	0.0238***	0.0131*
	(2.00)	(5.97)	(2.42)
Sense of Community	-0.00851	0.0526***	
	(-1.28)	(10.65)	
Region 2	0.0411***	0.0329***	0.0447***
	(8.06)	(8.19)	(8.17)
Region 3	-0.0320***	0.00283	-0.0307***
	(-4.92)	(0.57)	(-4.67)
Region 4	-0.0838***	0.118***	-0.0697***
	(-5.36)	(7.60)	(-3.53)
N	47808	47808	47808

*t statistics in parentheses * p<0.05, ** p<0.01, *** p<0.01*

Table 7: Probit Estimation (dependent variable SRH) using panel ENEMDU 2013-2014

Happiness	0.529*** (36.09)
Age	-0.0300* (-2.02)
Age Squared	0.0000219 (0.15)
High School	0.0520 (1.53)
University	0.105 (1.78)
Racial Minority	0.0632 (1.40)
Work	0.0568* (2.56)
Racial Minority	-0.0339 (-1.26)
Good Income	0.121*** (5.70)

Acceptable Income	0.186***
	(10.03)
N	19654

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 2: Best fitting SEM model

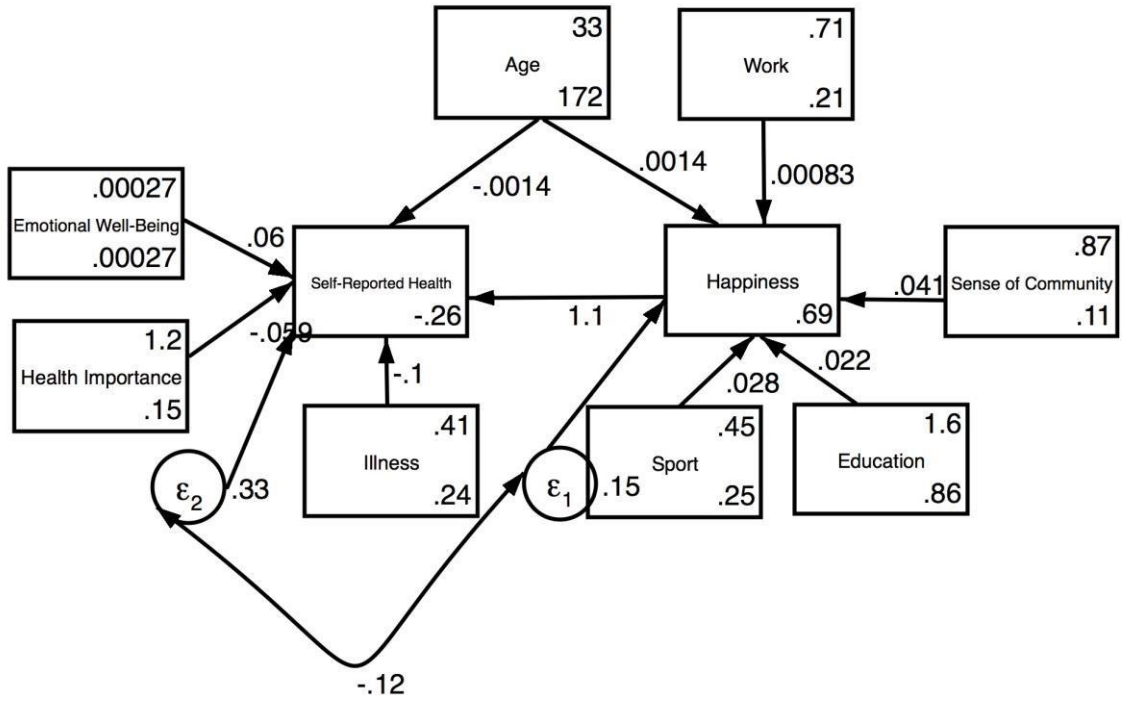

Table 8: Maximum Likelihood estimates for SEM model

	A. Direct Effects		B. Indirect Effects on Self-Reported Health
	Self-Reported Health	Happiness	
Self-Reported Health	-	-	-
Happiness	1.088*** (10.66)	-	-
Emotional Well-Being	0.0603 (0.48)	-	-
Sport	-	0.0282*** (9.51)	0.0067*** (6.75)
Health Importance	-0.0587*** (-10.81)	-	-
Illness	-0.101*** (-23.70)	-	-
Age	-0.00140 *** (-6.62)	0.00136*** (10.09)	0.000147*** (7.94)

Education	-	0.0216*** (13.23)	0.0234*** (10.58)
Work	-	0.000829 (0.24)	0.0090*** (0.24)
Region	-0.00714** (-2.78)	-	-
Sense of Community	-	0.0405*** (7.93)	-