What are the determinants of subjective well-being of healthy adults in rural communities in and around forests?

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Abstract

Sustainability goals are seeking to jointly improve environmental conditions and the well-being of society. Yet achieving both environmental and human well-being goals remains challenging because improving the material well-being of people can often mean increasing the risk of environmental and ecosystem degradation. An alternative method that may help meet both goals is to target non-monetary determinants of subjective well-being. However. few studies have examined the determinants of subjective well-being in industrializing countries. Here, we report on an analysis examining the determinants of subjective well-being among health, working adults in rural villages in and around forests in the Berau Regency, East Kalimantan, Indonesia. We find there is no significant relationship between subjective well-being and measures of monetary well-being, such as income and assets. Instead, we find age, sex, self-assessed health status, and occupation are significantly associated with subjective well-being. Our results have implications for policies seeking to improve subjective well-being among these populations.

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1. Introduction

Global sustainability goals now seek to simultaneously address environmental and human well-being goals. For instance, Goal 12 of the Sustainable Development Goals (United Nations General Assembly, 2015) articulates responsible consumption and production, highlighting the importance of sustainable pathways to consumption and production that minimize environmental degradation. In practice, however, achieving both environmental and human well-being goals remains challenging because improving the material well-being of people can often mean increasing the risk of environmental and ecosystem degradation (Myers, 2017; O'Neill et al., 2018; Raworth, 2017; Steffen et al., 2015). As a result, decision-makers in government and non-governmental organizations are increasingly interested in improving the well-being of people beyond just incomes or assets. Indeed, an alternative method may be to focus on improving factors that increase non-monetary factors of subjective well-being – that is people's "happiness" – and develop policies tailored to these factors (Bache et al., 2016; O'Neill et al., 2018).

Practitioners and scholars alike have recognized the importance of looking beyond income to increase people's well-being, in measurement and policies. One line of scholarship has focused on measuring poverty and other multidimensional concepts, such as women's empowerment. Recent multidimensional poverty indices (Alkire and Foster, 2011; Gönner et al., 2007) have sought to capture the complex underlying drivers of poverty. Smith et al. (2013) conducted an exhaustive review of indices, highlighting the growing number of indices that capture multiple dimensions of human well-being. More recently, the Women's Empowerment in Agriculture Index (Alkire et al., 2013) attempts to capture the multiple dimensions of women's empowerment, where four of the five subindex factors are non-monetary factors (decision-making about agriculture, access to and decision-making about productive resources, leadership in the community, and time allocation).

Another growing literature has sought to instead directly measure and understand people's life satisfaction – also commonly referred to as subjective well-being or happiness (Diener et al., 1999). This literature, rooted in psychological research, has extensively examined the determinants of subjective well-being finding, for instance, that age (Frijters and Beatton, 2012), health (Gerdtham and Johannesson, 2001), unemployment status (Clark, 2003; Gerlach and Stephan, 1996; Theodossiou, 1998), and income (Kahneman and Deaton, 2010) are all significantly associated with subjective well-being. Identifying determinants of well-being can provide insights for developing policies that increase people's quality of life driven by factors

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beyond income, such as work-life balance and health. Yet most of this literature has examined the determinants of happiness in industrialized country settings. These studies may have limited external validity to populations in industrializing countries as they have distinct cultural, social, political, and economic contexts. Of the few studies that have used data from industrializing countries, studies have found similar levels of overall subjective well-being compared to populations in industrialized countries and that the determinants of well-being are similar (Reyes-García et al., 2016; Zorondo-Rodríguez et al., 2016), although income inequality does not appear to be significantly associated with subjective well-being (Reyes-García et al., 2018). Data on subjective well-being and its determinants from industrializing countries remains sparse. As a result, little work has examined the determinants of subjective well-being of populations living in rural, subsistence communities who are often the target of development policies and are on the frontline of environmental pressures. These populations face unique constraints compared to their urban counterparts: they often lack access to basic infrastructure, public services, and other amenities or services that can make life easier. All these factors can affect levels of happiness and its determinants.

We report on analyses of the determinants of subjective well-being among rural communities living in or around forests in the Berau Regency, East Kalimantan, Indonesia. We use data from 361 healthy, working adults in 10 villages, and find subjective well-being is significantly associated with age, sex, occupation, and self-assessed health status. We do not find an association between subjective well-being and measures of material well-being, such as income and assets. Results suggest policies may improve the subjective well-being of healthy working adults by improving health or providing distinct employment opportunities beyond farming, civil service, and logging.

2. Materials and methods

This study uses data from individual and household surveys from 362 individuals from 201 households in 10 villages in the Berau Regency, East Kalimantan, Indonesia. All protocols and methods were approved by University of Washington Human Subjects Division (FWA #00006878), and participants provided verbal consent to take part in the study. Data were collected from October 1 – November 6, 2017. We used a three-stage random selection process to select villages, households, and individuals. First, 10 villages were selected based their surrounding environmental/landscape characteristics. Villages were included if they were on the

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mainland of the Berau Regency and had less than 15% water cover and 5% mangrove cover in a 5 kilometer buffer around the village. Villages also had to be at least 20 kilometers from the regency capitol and be accessible by road. Of the 113 villages in the Berau Regency 37 villages met these criteria. We then divided the 37 villages into two groups based on the median of intact forest cover: those that had more than 31% of landcover consisting of intact forest, and those that had less than 31% of landcover consisting of intact forest. Five villages were randomly selected from each group. This median split was done to capture differential experiences of communities based on how deeply imbedded they were in forests.

The second and third-stage of random selection was at the household and individual-level. Enumerator teams first entered a village and gathered a list of all households in the village. Approximately 20 households were randomly selected in each village. Household rosters were then gathered for randomly selected households. This was done so we could randomly select up to two healthy adults to participate in the study. Randomly selected individuals were eligible to participate in the study if they were over 21, could lift more than 10 kilograms, and had no recent or chronic respiratory or cardiac issues. We focused on healthy adults because a broader purpose of the study was to understand how climate change and deforestation were affecting working populations in these communities.

Household surveys collected extensive data on household composition and other demographic information; household assets, productive assets, and natural resource use; income sources and government assistance; environmental quality and change; and ecosystem services. Individual surveys collected information on an individual's health status and history; weight, height, and heart rate; previous day's time use; current and future subjective well-being; work habits; experiences working in hot environments; and occupational health practices. In addition to the surveys, individuals participated in an in-field experiment designed to examine the productivity and cognitive impacts of working in forested versus open landscapes. Further, high frequency data on ambient temperatures, relative humidity, globe temperature, and wet bulb globe temperatures were collected for approximately 2.5 days in each village in forests, open areas, and oil palm patches.

For our current analysis, we use data on subjective well-being as our dependent variable. Our survey instrument used a Cantril Ladder Scale question to gather data on life satisfaction, which is a validated scale commonly used to measure subjective well-being (Easterlin, 1974; Frey et al., 2007; Stevenson and Wolfers, 2008). This question asks:

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> Now I want to ask you about your life. Please imagine a ladder with steps numbered from zero at the bottom to ten at the top. Suppose we say that the top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. If the top step is 10 and the bottom step is 0, on which step of the ladder do you feel you personally stand at the present time?

We build on existing work by Easterlin (Easterlin, 1974), Kahneman and Deaton (Kahneman and Deaton, 2010), and others to assess the determinants of happy using the following general linear regression:

$$SWB_{ijk} = \beta_0 + \beta_1 \boldsymbol{X_{ijk}} + \beta_1 \boldsymbol{Z_{ij}} + \beta_1 \boldsymbol{V_k} + \boldsymbol{\varepsilon_{ijk}}$$

Where *i, j,* and *k* indexes the individual, household, and village, respectively. SWB_{ijk} is subjective well-being and is treated as a continuous variable. $\boldsymbol{X_{ijk}}$ is a vector of individual covariates, which includes age, age-squared, female, health status, and occupation (where the referent category is *farmer*). $\boldsymbol{Z_{ij}}$ is a vector of household covariates, which includes household size, value of household assets, value of productive assets, farm income in the past year, and non-farm income in the past year. Finally, $\boldsymbol{V_k}$ is a vector of environmental covariates extracted from a 5 kilometer buffer using remotely sensed data. Covariates include distance to the regency capitol, and percent of land that is identified as oil palm, timber plantation, logging, agroforest, and intact forest within the 5 kilometer buffer. We estimate the model with robust standard errors clustered at the household-level. Not all participants had all data, so our final analytic sample consists of 361 individuals.

3. Results

a. Population description

The study population was, by design, healthy. Participants are, on average, 41 years of age, and approximately half are female (Table 1). The vast majority of respondent's primary occupation is farming, although many engage in multiple activities for income generation. Households in our study villages commonly grew rice (63%), corn (33%), oil palm (24%), bananas (20%), and peppers (16%) and chilis (18%). Although farming is the most common

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primary occupation, farming income made up, on average, just 16% of total household income in the past year. Non-farm income was typically from wage labor, construction, and other manual labor. Study participants had, in general, high life satisfaction. The average subjective well-being score was 5.7, and approximately 80 percent of respondents had a Cantril ladder score greater than five (Figure 1).

b. Regression results

Regression results indicate that both age is linearly and non-linearly associated with subjective well-being. Older individuals have lower subjective well-being, although this effect diminishes with age. Females have, on average, nearly half a point higher subjective well-being scores compared to men. An individual's primary occupation significantly affects their subjective well-being. Compared to farming, day laborers have a full point higher subjective well-being. Other occupations, however, are no different than farming. Unsurprisingly, an individual's self-assessed health status is negatively associated with subjective well-being, with those rating themselves in poor health having more than a one point lower subjective well-being score. Surprisingly, income from both farming and non-farming activities and the value of assets is significantly associated with subjective well-being. We also fail to find any relationship between landcover and subjective well-being and distance to the capitol to subjective well-being.

4. Discussion

Using a unique dataset from 10 rural villages in the Berau Regency, East Kalimantan, Indonesia we examine the determinants of subjective well-being of healthy adults. Contrary to past studies, we focus exclusively on rural, subsistence communities living in or around forests. The Berau Regency, like many tropical forest landscapes, has experienced significant change in the past decade. Forests have been cleared for oil palm, logging, mining, timber plantations, and for agricultural use (Griscom et al., 2016). At the same time, the population has grown nearly 20% since 2010 (Berau, 2017). Understanding the determinants of subjective well-being in the face of these environmental and demographic pressures is important for policies targeting sustainable development in the regency.

Our results are reflect similarities with the growing work estimating the determinants of subjective well-being in industrialized countries (Reyes-García et al., 2016). Overall, subjective well-being of our study population was high, suggesting overall quality of life is relatively high.

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Interestingly, the distance to the regency capitol was not significantly associated with subjective well-being, indicating that market access, even for the most remote villages in our study, has no relationship to subjective well-being of healthy, working individuals. At the same time, environmental variables appeared to have no relationship to subjective well-being. This is interesting because our sampling strategy explicitly sought to create variation in environmental conditions.

Perhaps most surprisingly was that variables measuring material well-being, such as income or assets, had no relationship to subjective well-being. Instead, our results indicate that an individual's demographic characteristics, such as self-assessed health status, age, and sex, had strong associations with subjective well-being. We also find that working in day labor is associated with a significant increase in subjective well-being compared to the dominant primary occupation, farming. These results suggest policies may increase subjective well-being through health programs, or through employment programs that provide qualitatively different work experiences compared to the dominant occupation. Further research should investigate why economic variables had no relationship to subjective well-being.

Our results are only indicative of healthy, working adults. Subjective well-being may differ for working adults in poorer health or who face significant disabilities that can create challenges for everyday life. Further, older populations may have significantly different determinants of well-being. Future research should investigate these populations, as they are often less resilient and face considerable hardships compared to healthy, working adults.

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Table 1: Descriptive statistics for sample

	Mean	SD
Outcome variable		
Subjective well-being[a]	5.7	1.9
Individual characteristics		
Age	41	11
Female (%)	48	50
Years of schooling	6.3	3.5
Farmer (%)[b]	83	37
Logger (%)[b]	1.0	7.0
Day laborer (%)[b]	4.0	21
Government employee (%)[b]	1.0	7.0
Full-time student (%)[b]	1.0	9.0
Other occupation (%)[b]	3.0	16
Self-assessed health status[c]	3.2	81
Household characteristics		
Household size	4.5	1.5
Household assets (Millions IDR)	42	62
Productive assets (Millions IDR)	4.1	7.4
Income from farming (Millions IDR)	2.4	5.7
Nonfarm income (Millions IDR)	22	33
Village context characteristics		
Landcover - oil palm (%)	1.4	2.1
Landcover - timber plantation (%)	4.2	13
Landcover – logging (%)	46	13
Landcover – agroforest (%)	5.4	2.5
Landcover - intact forest (%)	27	20
Distance to capitol	71	24
n	361	

[a] This question asked: "Now I want to ask you about your life. Please imagine a ladder with steps numbered from zero at the bottom to ten at the top. Suppose we say that the top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. If the top step is 10 and the bottom step is 0, on which step of the ladder do you feel you personally stand at the present time?"

[b] Responses asked about a person's primary occupation. Note that individuals commonly engage in more than one job/activity.

[c] Responses come from a question asking, "Would you say that, in general, your health is excellent, very good, good, fair, or poor?"

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Figure 1: Distribution of subjective well-being

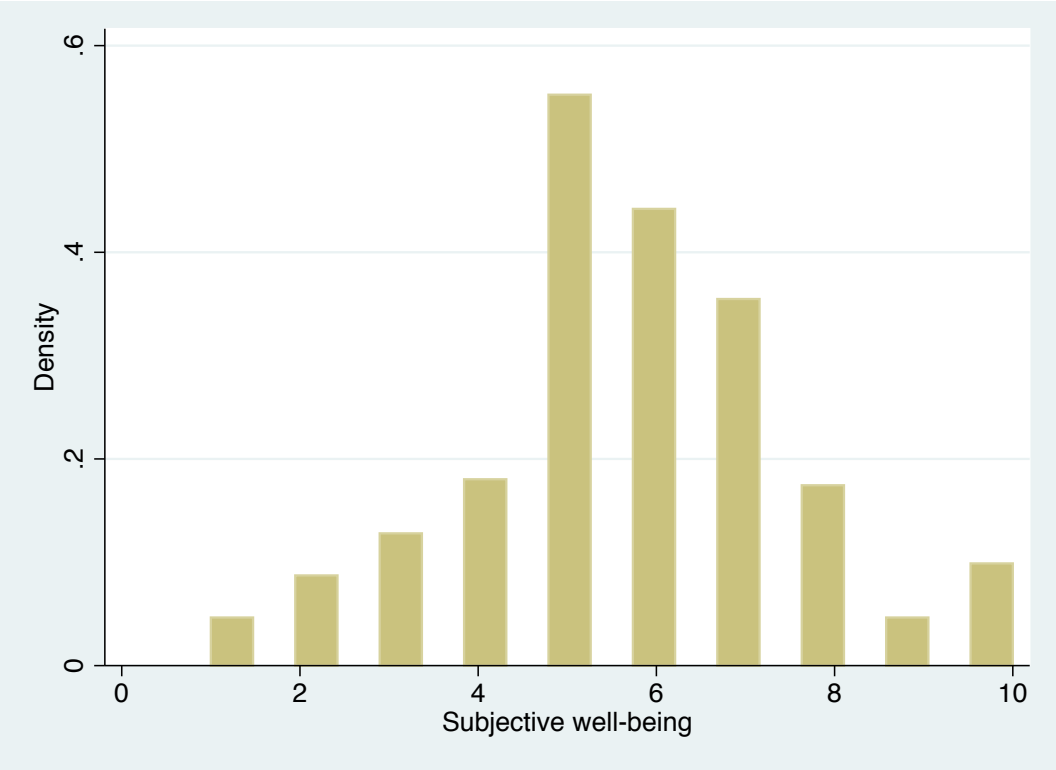

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Table 2: Regression results for determinants of subjective well-being[a]

Variable	Coefficient	SE
Age	-0.11*	(0.064)
Age-squared	0.00*	(0.001)
Female	0.40**	(0.173)
Years of schooling	0.02	(0.033)
Logger	-0.82	(0.661)
Day laborer	1.13**	(0.462)
Government employee	0.37	-(0.392)
Full-time student	-0.76	(1.104)
Other occupation	-0.2	(0.759)
Self-assessed health status	-0.30**	(0.121)
Household size	0.04	(0.076)
Log household assets	0.09	(0.067)
Log productive assets	0.17	(0.118)
Log income from farming	-0.01	(0.02)
Log nonfarm income	0.02	(0.023)
Percent oil palm	0.027	(0.086)
Percent timber plantation	0.0081	(0.020)
Percent logging	0.0052	(0.025)
Percent agroforest	0.045	(0.12)
Percent intact forest	0.014	(0.013)
Distance to capitol	0.00	(0.009)
Constant	3.63	(3.22)
R^2	0.12	
n	361	

[a] Model estimated with robust standard errors clustered at the household-level.
*** p<0.01, ** p<0.05, * p<0.1

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