

“Deaths of despair in the tropics?”: Relative deprivation among middle-aged Costa Ricans*

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Abstract.

Marmot and Wilkinson (2001) have proposed that relative socioeconomic status (SES) is a relevant factor that explains that wealthier or more educated people have lower mortality than lower status populations, the so-called SES gradient in mortality. This framework is closely linked to the idea of “deaths of despair”. The main goal of this article is to study the SES mortality gradient in Costa Rica using subjective assessments of SES in the past and in the present, using longitudinal data from the Retirement cohort of the CRELES Project. Perceived SES is operationalized through the answers to questions about subjective social position in a hierarchy. Costa Ricans with perceived downward mobility are more likely to die than Costa Ricans who improved their perceived SES over time, especially due to cancer, cardiovascular conditions, or alcohol-related causes, and are more likely to report current smoking and stress.

Introduction

In the study of socio-economic status (SES) differentials in health, Marmot & Wilkinson (Marmot & Wilkinson, 2001; Marmot, 2003; Wilkinson, 1997) have proposed that relative SES – associated with income inequality– explains the lower mortality and morbidity of people with greater education, income or wealth, compared to people with less resources. The topic of SES gradients has been relevant in Europe, Australia, and the U.S. Nonetheless, recent evidence for Latin American and Asian countries shows that lower SES elderly people might have lower death

* Paper submitted to IPC2021.

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rates and prevalence of different morbidities than their higher SES peers (Rosero-Bixby, 2018). In Costa Rica, people with fewer years of schooling or lower income have lower death rates (Rosero-Bixby & Dow, 2009; Rosero-Bixby, 2018), healthier biomarker levels (Goldman et al., 2011), and higher probability of utilizing preventive services, especially those related with cardiovascular health (Brenes-Camacho & Rosero-Bixby, 2009). This research aims to study whether mortality probabilities and morbidity prevalence are associated with relative SES in different stages of the life course.

Literature Review.

The theory of relative deprivation argues that people who compare their SES with their peers and sense that they are disadvantaged have worse health (Kondo et al., 2008). The main mechanisms that explain the relationship refer to psychosocial conditions. Perceived disadvantage, especially in the possibility of controlling won SES, produce stress and frustration, which conduct to unhealthy lifestyles: addictions, sedentariness; both stress and lifestyles are risk factors of cardiovascular related diseases (Marmot et al., 1997; Marmot & Wilkinson, 2011). Additionally, income inequality drives to unbalanced comparisons inherent to relative deprivation, and income inequality is also associated with higher death rates due to external causes (Marmot & Wilkinson, 2011), and with higher crime rates –homicides and property crimes–; therefore, Kawachi, Kennedy & Wilkinson (1999) argue that relative deprivation springs from contexts of social disorganization.

Empirical analysis of relative deprivation theory has shown that its indicators are associated with mortality and morbidity even after controlling for absolute income (Kondo et al., 2008; Subramanyam et al., 2009). In England, relative deprivation indices predict both physical and mental health (Mishra & Carleton, 2015); however, with more complex econometric models, Jones & Wildman (2008) find low association only among men. Gender differences have been observed in Israel (Jaffe et al., 2005); household SES is a better predictor of mortality among men than among women, but neighborhood SES has no predictive power; this pattern suggests that relative deprivation is not too relevant. Nonetheless, among women, neighborhood SES predicts mortality better than household inequality.

Relative deprivation theory is at the heart of the explanations for the “deaths of despair”. As Case & Deaton (2015) explain, the increasing trend in death rates among middle-aged non-

Hispanic Whites in the U.S. might be related to a sense among these population that their social context is changing fast and their social standing is not as advantaged as in the past. As with the relative deprivation framework, some people might perceive that “others” are faring better. These comparisons lead to deaths related to external causes (suicides, violent deaths, poisoning, etc.) or to unhealthy lifestyles (mortality related to alcohol and drug overuse). Stein et al. (2017) compare the trends by race and ethnic categories, and show that death rates due to these causes increased for non-Hispanic Whites between 1999 and 2015, but decreased for non-Hispanic Blacks and for Hispanics; nonetheless, the minority groups still have higher death rates than non-Hispanic Whites. Using more detailed groupings based on age, race and ethnicity, Woolf et al. (2018) show that death rates due to drug-and-alcohol related problems have increased among Blacks, Native Americans, and Hispanics, as well as hypertensive-related deaths. Goldman, Glei, & Weinstein (2018) operationalize “despair” using four psychometric constructs: negative affect, positive affect, life satisfaction, and psychological well-being. They describe how, between the late 1990s and early 2010s, negative affect has increased and positive affect and life satisfaction have decreased considerably among low SES non-Latino White Americans (ages 25 to 74), while the trend is inverse for their higher SES peers. With the same data, Glei, Goldman & Weinstein (2018) create a measure of relative deprivation based on ranks of a composite SES index and find that financial stress, perception of intergenerational disadvantage and work uncertainty are greater among those with lower relative SES than among those with higher relative SES and, more importantly, that the gap has increased in a 15-year period. In general, they observe that the disparities based on subjective measures have grown more than the disparities based on objective measures of financial strain and work uncertainty. These authors’ analyses are a clear link between the recent trends of growing despair and relative deprivation.

Other authors challenge the notion of “despair” arguing that the mortality reversal might be explained chiefly by the opioid epidemic that the U.S. has been experiencing during the 21st century (Botelho et al., 2017; Ruhm, 2018); their main argument is that drug overdoses can be classified as outcomes of despair, but drug-addiction (especially for heroine and other opioids) spring from more complex processes rather than just despair.

Material and methods.

We use the second cohort, the “Retirement cohort”, of the CRELES project. It gathered information about people born between 1945 and 1955 and living in Costa Rica in 2010. It was designed with two waves. The sample was selected with a probabilistic four-stage design: health areas, census tracts, households, and individuals. The fieldworkers interviewed 2798 persons between January 2010 and December 2011 in the first wave, and 2478 persons in the second wave between January 2012 and January 2014; the attrition rate was 11%; the main cause of losses to follow-up were individuals that could not be found at their residence during the second visit.

The main dependent variable is mortality. CRELES data are matched with the Costa Rican Death Index (the National Death Registry), managed by the National Direction of the Civil Registry. The latter database includes information about the exact date of death. Additionally, we study biomarkers collected by CRELES: C-reactive protein CRP (inflammation biomarker), total cholesterol (dyslipidemia biomarker), and HbA1C (Glycated hemoglobin, marker associated with diabetes mellitus control). Self-reported health conditions –bad health, hypertension, cholesterol, diabetes mellitus, cancer, pulmonary disease, heart attack, stroke, arthritis, osteoporosis, cataracts, and disability (measured as need for help for ADLs and IADLs)– are used as both dependent variables related to health status, and as independent variables that may predict death. Other analyses analyze association between relative deprivation and life style characteristics –obesity, current smoking, alcohol intake, and social isolation (reporting having no friends)–, self-reported stress due to health and financial situation, and having depressive symptoms (a score of 10 points or more in the Geriatric Depression Scale CESD).

In the empirical studies about the topic, one of the challenges is the operationalization of relative deprivation. In individual-level survey-driven data, the concept is approached using psychometric scales (Mishra & Carleton, 2015), as well as indices that compare individuals’ or neighborhood’s income with the country’s mean income (Kawachi, Kennedy & Wilkinson, 1999; Kondo et al., 2008; Subramanyam et al., 2009). At the aggregate level (countries, administrative geographical units), researchers use general income inequality measures, such as the Gini Index or the RHI (“Robin Hood Index”) (Kennedy, Kawachi & Prothrow-Stith, 1996). In this paper, the main explanatory variables associated with relative SES are measured with a battery of

questions. Each interviewee gets a drawing of a ladder with values from 1 to 10 in each step. Next, there is an introduction that states: “Think of this ladder as representing where people stand in their communities. At the top of the ladder are the people who have the highest standing in their community, those who have the most money, the most education and the most respected jobs”. After the introduction, there are several questions about in which step in the ladder the interviewee would view himself/herself at the current moment, when he/she was born, when his/her first child was born, and when their children would become as old as the interviewee. To understand external validity of the scales, we computed the correlation of each of them with the answers to the following questions: (a) a 1-to-5 scale about current socio-economic situation; (b) questions about economic limitations at the current moment, and when the individuals were 18 year old or during the 1980/1981 economic crisis; (c) income and education; and (d) a simple additive index of assets ownership.

The values of the ladders were recoded into two categories: Values from 1 to 5 were recoded as zero and labeled as low, while values from 6 to 10 were recoded as one and labeled as high. A final variable categorical variable was created using the information about perceived SES in the present, and perceived SES when the interviewee’s first child was born; four categories were obtained: “Low in the past, Low in the present”; “Low in the past; High in the present”; “High in the past, High in the present”; and “High in the past, Low in the present”. The latter is the most important category because it implies downward mobility and, hence, relative deprivation, given that these Costa Ricans knew what it meant to have high SES in the past, but now face relative economic hardships.

We estimate several regression models in which the odds of death depend on this categorical variable as the main predictor, controlling for such variables as sex, age, urban/rural residence and self-reported history of diagnosed chronic diseases. We also estimate random effects logistic models in which morbidity, lifestyle and health condition variables are the dependent variables. We use random effects models because we use information from the two waves of CRELES-RC database.

Results

Graph1 describes death probabilities for different levels of subjective SES. The clearest trend is observed in the scale about economic condition at the time of the first child’s birth: the

greater the scale, greater the death probability. The trend is inverse for the current economic condition scale: the greater the scale, the smaller the death probability, except for the scale being equal to 10. As mentioned before, WE create a new categorical variable combining these two scales. The new variable has four categories: low in the past, low in the present; low in the past, high in the present; high in the past, high in the present; and high in the past, low in the present. This variable is the one used in the regression models.

We estimate a sequence of logistic models in which the dependent variables is whether the person died between the first interview (2010/2011) and October 31st, 2017 (There are also two dummy variables that represent missing values: Unknown responses to the ladder questions about the past and the present). In the first equation, the mortality probability depends only on the main explanatory variable operationalized as dummies. In the second equation, the probability is a function of health covariates (biomarkers), demographic variables, and two “objective SES” measures: years of schooling and having high income, dummy variable that is equal to one if the couple’s (or individual’s, if not married) is equal to one (approximately US\$500 per month). The third equation combines the categorical variable based on the ladder scales, and the sociodemographic variables, while the fourth equation adds the biomarker information to the third equation.

According to the first equation, there are two contrasting gradients. Costa Ricans with simultaneously higher SES in the past and lower SES in the present are more likely to die than Costa Ricans who improved in their perceived SES over time. Respondents with low SES in both scales have similar mortality levels than those with high SES at both stages in the life course. The coefficients of the relative deprivation variable remain sizable and significantly different from zero even after controlling for biomarkers, demographic covariates, and objective SES measures.

It is worth commenting about the Odds ratios linked to the dummy variable that refers to missing values in the ladder scales. None of these Odds Ratios is significantly different to one; nonetheless, the direction and size of the coefficients reveal useful information. Those who did not respond the “current time” ladder questions have lower mortality odds than those who improved their perceived SES, while those who had missing values in the “ladder of the past” have higher mortality. A possible explanation of this relationship is healthier people had

problems of remembering the past. However, further investigation is required to understand what non-response means in these relationships.

It is also worthwhile highlighting that there are no clear SES gradients with the objective measures. Mortality is very similar regardless of schooling or income. Even of the Odds ratio for high income is not significantly different from one, its value (OR=1.18) suggests that people with higher income have higher mortality. When comparing the set of SES measures, these results suggest that subjective SES is a better predictor of mortality than objective SES measures. Finally, sex, HbA1C, CRP and grip strength are good predictors of death probabilities.

A multinomial logistic regression is used to determine death probabilities by cause of death. We construct a qualitative variable with four categories: Alive (base), death due to cancer, death due to cardiovascular or alcohol-related (mainly cirrhosis) causes, and other causes. The multinomial model control for the health and sociodemographic variables. The odds of dying due to cancer or to cardiovascular and alcohol related diseases among those who perceive they were better off in the past are 6 times and 3.85 times the odds among those who perceived that they have low SES throughout their lives. Higher odds of cardiovascular mortality is predicted by relative deprivation theory given that perceived downward mobility might lead to unhealthy lifestyles. Results for cancer mortality are not clearly related to the theoretical framework stated above. Nonetheless, the most prevalent tumors in Costa Rica (lung cancer, stomach cancer, cervical cancer) are also related to unhealthy lifestyles during the life course.

In order to understand the perceived SES gradient in health, we estimate a series of random effects logistic regression equations in which the dependent variables are the prevalence of non-communicable diseases (based on self-reported data) and the prevalence of reporting bad health (Table 2). People who sense that they experienced upward mobility are more likely to report bad health than people with low perceived SES throughout the life course. However, middle-aged Costa Ricans that have been better off during their life have lower mortality. Hence, there is no evidence of the relative deprivation pattern observed for mortality, but there is a relationship between upward mobility and health perceptions. Additionally, people who sense that they had high SES in the past are less likely to report a cholesterol diagnosis, than those who had low SES in the past.

The only pattern that coincides with the relative deprivation theory is the one observed for disability because people who experienced perceived downward mobility have 66%% greater odds of needing help in activities of daily living. Besides, there is a similar pattern for stroke; however, given that the number of cases with a history of cerebrovascular mortality is small, the associated Odds ratio is not significantly different to one. In general, the logistic regression ORs show a small or nonexistent association between perceived changes in SES and most of the health problems studied in CRELES. We estimate similar models as those presented in Table 2, but with incidence probabilities instead of prevalence proportions. Given the reduction in the sample size after controlling for having the condition at baseline, there are no coefficients that are significantly different to zero, except for self-reported bad health; this last model derives into similar conclusions as the respective prevalence equation in Table 2.

Following the mechanisms described by the relative deprivation hypothesis, we also estimate random effects logistic regressions for variables related to lifestyles (obesity, current smoking, alcohol intake, and social isolation), stress (due to health or due to financial situation), and presence of depressive symptoms (Table 4). People with perceived downward mobility are clearly more likely to smoke than people with perceived upward mobility (OR=2.6). They are also more likely to be stressed, depressed, and with no friends, although people who reported to have low SES in the past and in the present have higher prevalence of these conditions, too. The latter pattern suggests that social isolation, stress and depressive symptoms might be related to current deprivation in general, rather than to perceived downward mobility.

Discussion.

Research on SES gradients in mortality and health in general have been useful for promoting health-related public policies for people with fewer economic resources (Marmot, 2003). However, the results that relate SES inequality with health indicate that improving the health of disadvantaged groups require strategies that consider the social stratification of human groups. Moreover, scientific evidence that supports the theory of relative deprivation suggests the importance of mental health services that could improve the sense of belonging of low SES populations (Marmot & Wilkinson, 2001).

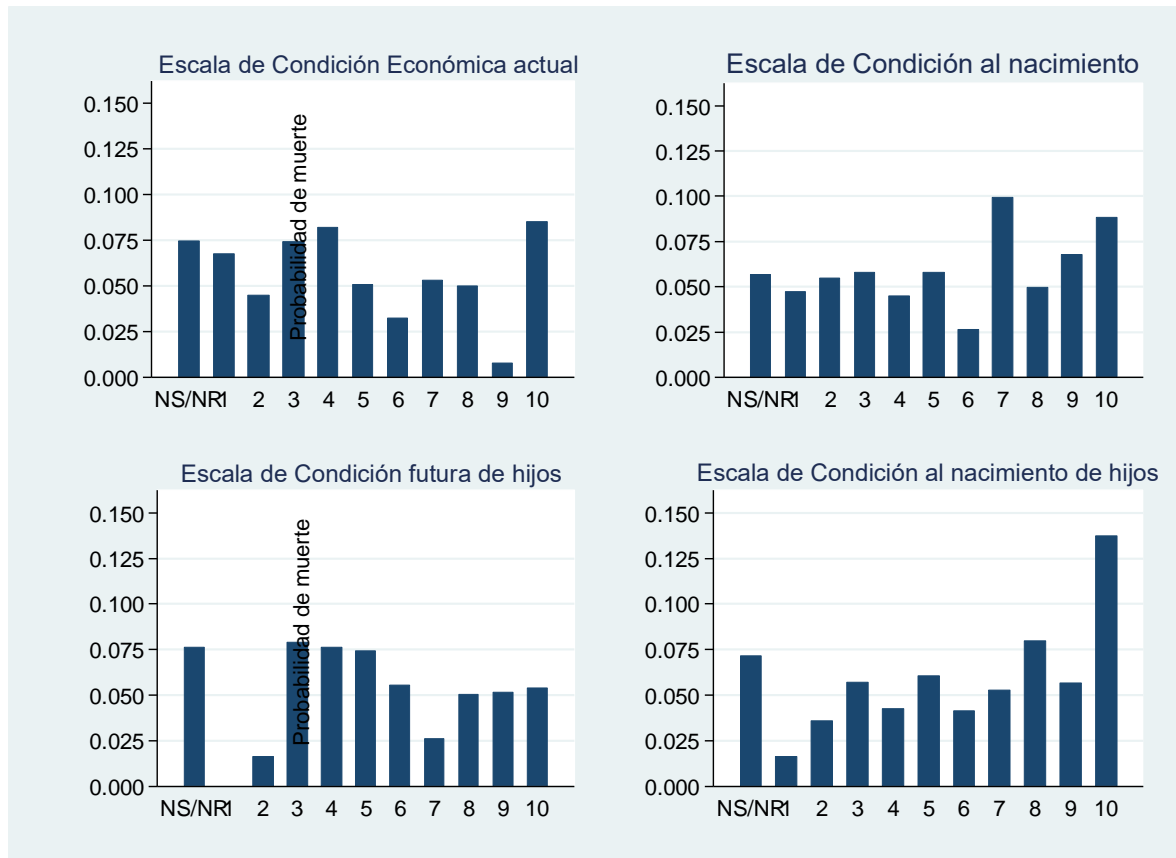
Within the relative deprivation framework, this analysis complements the findings of different researchers about SES gradients in health in Costa Rica and Latin America (Rosero-Bixby & Dow, 2009; Rosero-Bixby, 2008; Goldman et al., 2011). With the new cohort of the CRELES study, we reproduce the previously observed pattern that people with higher income have higher death probabilities than the persons with lower income. Nonetheless, the expected direction is observed for the perceived SES gradient in a life course perspective. People with higher mortality are those who had higher relative SES when they were young but have worse relative SES in older ages.

It was mentioned before that this type of association is suggested by the analysis of Case and Deaton (2015) currently in the U.S. and of Shkolnikov and colleagues (Shkolnikov et al., 2004) about the reduction of life expectancy in Russia and Eastern European countries after the collapse of the Soviet Union. From these authors' points of view, people –especially middle-aged men– that perceive that their SES has worsen compared to their peers (even if income levels remain equal and constant) would experience higher mortality. Increases in mortality and morbidity at intermediate ages are reported for causes related to alcohol and drug consumption, suicides, and poisoning. Costa Rican data do not provide evidence for this causal link, although it shows that middle-aged Costa Ricans who experienced perceived downward mobility are more likely to smoke and more likely to be stressed and to report social isolation and depressive symptoms. However, given that there are no mediating processes between these conditions and mortality, our results concede more support to the traditional explanation of the relative deprivation theory: the sense of own's worsening SES as a risk factor of vascular mortality.

The description of this cohort is particularly important because its lifecourse temporally coincide with macroeconomic processes experimented in Costa Rica during the last 40 years. At the end of the 1970s, Costa Rica was one of the Latin American countries (with Uruguay) with the lowest income inequality according to the Gini Index. After the 1980/1981 economic crisis, Costa Rica faced an increase in income concentration, even though most of the countries in the región had the inverse process. This analysis's results start to show empirical evidence about the detrimental consequences of income concentration on health.

Tables and Graphs

Graph 1. Costa Rica: Death probabilities, by subjective SES scales.



Source: CRELES.

Table 1. Logistic regression coefficients for death probability between 2010 and 2017, by perceived SES, controlling for covariates.

Variables	Eq 1		Eq 2		Eq 3		Eq 4	
	OR	p-value	OR	p-value	OR	p-value	OR	p-value
Perceived SES								
(Base: High present, low past)								
Low present, low past	1.898	0.071			1.952	0.056	2.138	0.042
High present, high past	1.876	0.052			1.610	0.160	1.837	0.093
Low present, high past	3.367	0.004			3.245	0.005	3.781	0.002
Missing values in current SES ladder	0.848	0.795			0.829	0.780	0.799	0.754
Missing values in past SES ladder	1.772	0.278			1.745	0.300	1.467	0.503
Males (Base: Women)			3.149	0.001	1.759	0.013	3.093	0.001
Age			1.062	0.087	1.074	0.047	1.064	0.079
Years of schooling			0.987	0.661	0.966	0.223	0.982	0.553
In conjugal union (Base: Not in Union)			0.896	0.660	1.034	0.891	0.970	0.902
High income (Base: Monthly income < 280K colones, approx. US\$500)			1.190	0.487			1.181	0.522
Total cholesterol (in mg/dl)			1.000	0.914			1.000	0.909
Glycated hemoglobin HbA1C (in mg/dl)			1.269	0.001			1.281	0.001
C-reactive protein (in mg/l)			1.031	0.001			1.035	0.000
Grip strength (in Kg)			0.968	0.072			0.965	0.049
Physically dependent (Base: Not dependent)			1.906	0.119			1.772	0.146

Source: CRELES

Note: In bold letters, significant coefficients at a 5% significance level

Table 2. Multinomial logistic regression coefficients for cause of death probability between 2010 and 2017, by perceived SES, controlling for covariates. (Base: Alive)

Variables	Cancer		Cardiovascular and alcohol-related		Others	
	OR	p-value	OR	p-value	OR	p-value
Perceived SES						
(Base: High present, low past)						
Low present, low past	2.64	0.209	2.11	0.259	1.32	0.677
High present, high past	2.96	0.138	1.69	0.394	0.88	0.816
Low present, high past	6.00	0.022	3.85	0.030	1.66	0.502
Missing values in current SES ladder	0.24	0.346	1.46	0.732	0.12	0.055
Missing values in past SES ladder	6.74	0.045	0.73	0.744	2.40	0.131

Source: CRELES

Note: In bold letters, significant coefficients at a 5% significance level

Table 3. Logistic regression Odds Ratios for the association between perceived SES scales and prevalence of self-reported non-communicable diseases and self-reported health (Reference: High present, low past).

	High present, high past	Low present, low past	Low present, high past	Missing values in current ladder
Bad health	0.614 *	1.754 *	1.296	0.932
Hypertension	0.660	1.294	1.624	0.730
Cholesterol	0.322 *	0.993	0.406 *	0.077 *
Diabetes M.	1.083	0.783	0.500	0.614
Cancer	0.703	0.593	0.820	0.640
Pulmonary disease	0.780	0.935	0.392	2.705
Heart attack	0.388	0.908	1.125	1.334
Stroke	0.541	0.249	1.130	3.515
Arthritis	0.559	1.206	0.516	1.116
Osteoporosis	0.489	0.726	0.745	0.644
Cataracts	0.647	0.944	0.637	1.185
Disability (dependence)	1.147	1.416	1.657 *	5.003 *

Note: *: p<0.05

All models control for sex, age, schooling, marital status and income.

Table 4. Logistic regression Odds Ratios for the association between perceived SES scales and prevalence of unhealthy lifestyle markers, stress and depressive symptoms (Reference: High present, low past).

	High present, high past	Low present, low past	Low present, high past	Missing values in current ladder
Obese	1.150	0.629	1.640	0.457
Current smoking	1.244	1.751	2.599 *	1.374
Alcohol intake	0.351 *	0.865	1.026	0.748
No friends	1.480	2.563 *	3.529 *	0.190 *
Stress due to health	0.760	1.223	1.174	0.526 *
Stress due to finances	1.175	2.230 *	2.452 *	0.352 *
Depressive symptoms	1.030	1.749 *	2.713 *	1.368

Note: *: p<0.05

All models control for sex, age, schooling, marital status and income.

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