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Health & Place

journal homepage: www.elsevier.com/locate/healthplace

Longitudinal relation of community-level income inequality and mortality in Costa Rica

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ARTICLE INFO

Article history:

Received 28 January 2011

Received in revised form

23 May 2011

Accepted 12 July 2011

Available online 27 July 2011

Keywords:

Costa Rica

Inequalities

Mortality

Socio-economic

Small-area study

ABSTRACT

The controversy regarding the direct relationship between income distribution and health remains unresolved. Empirical evidence has often failed to advance our understanding because in the countries studied there was limited ability to distinguish hypotheses. This study examines the relation between inequality and mortality in the context of Costa Rica. Costa Rica's unique social and political structure makes confounding through resource and political channels less likely, thus any effects would work predominantly through direct psychosocial channels. Using mortality data extracted from the Vital Statistics Registry, we evaluate the longitudinal relations between lagged and contemporaneous income inequality and cause-specific mortality in Costa Rica from 1995 to 2005. For those aged 15–60, results indicate that there is a significant adverse relation between increases in lagged inequality and mortality from liver disease, and marginal adverse relations with mortality from diabetes and suicide. For those aged 60 and over, there is a limited evidence of a relation between inequality and health. These results suggest increases in inequality may impact health behavior of the working aged population in Costa Rica.

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1. Introduction

The relation between income inequality and health has been the topic of hundreds of articles, and the results of existing studies are inconsistent. When studies do find that income inequality is associated with poorer health, the interpretation of that association has been the subject of much controversy (Deaton and Lubotsky, 2003; Lynch et al., 2004a; Subramanian and Kawachi, 2004; Wilkinson and Pickett, 2006). Nonetheless, interest in the topic remains high—especially because income inequality continues to grow in most countries (Ferreira and Ravallion, 2008).

There are three key issues in the research to date that make it difficult to take steps towards resolving the controversy of how to interpret relations between income inequality and health based on empirical evidence: (1) inability to distinguish between broad theories due to the settings in which research has been conducted, (2) inability to clarify proximal mechanisms due to the outcomes examined, and (3) inability to reasonably interpret observed associations due to lack of consideration of appropriate

time intervals between income inequality and health outcomes. These issues are elaborated below.

The controversy around income inequality hinges on different theories about why we might observe associations between income inequality and health outcomes (Marmot and Wilkinson, 2001). Three general groups of theories have been proposed to explain the associations between health and income distribution: psychosocial, resource allocation, and neomaterial. The proposed psychosocial theory is the only one of the three whereby inequality *itself* has a direct negative impact on health. The psychosocial theory posits that the perception of social hierarchy causes frustration or invidious comparisons leading to chronic stress and at the same time may lead to diminishing social capital within a community (Kawachi et al., 2004). The increased stress coupled with the limited availability of social support could lead to increased substitution towards poor health behaviors as a coping mechanism (Brown et al., 2006). Alternatively, many argue that income inequality may affect health through its impact on local resource allocation. For example, areas with high inequality may also have lower investment in local resources due to divergent preferences and local taxation laws, and the consequent lack of resources affects health rather than inequality itself (Lynch et al., 2004a,b). Finally, the neomaterial view of the inequality and health relation contends that deep societal and contextual processes generate both inequality and poor health. Under this interpretation, the effects of income inequality on health are

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contingent on the distribution of other social resources in the society, thus income inequality captures a combination and accumulation of other negative exposures, lack of individual resources, and systematic underinvestment in health and social infrastructure (Lynch et al., 2000). Disparities among racial groups and entrenched discrimination are often cited examples of the neomaterial mechanism.

The most consistent evidence of a positive association between income inequality and mortality has been found in the US—a setting in which the three theories cannot be adequately distinguished due to confounding by race and history. For instance, Deaton and Lubotsky (2003) argued that the effects of racial composition confound studies that have found that mortality rates are positively correlated with income inequality across the cities and states in the US. Specifically they found that the fraction of the population that is black was positively correlated with average white incomes, and negatively correlated with average black incomes. Between-group income inequality is therefore higher where the fraction black is higher, as is income inequality in general. Areas where the fraction black was historically higher have also been areas with underinvestment in many dimensions. Thus, the history of slavery and the taxation laws regarding distribution of local goods make it difficult to dispute a role for the resource allocation or neomaterial interpretations in the US, but a psychosocial interpretation cannot be ruled out. Beyond the long-term effects of slavery, the overall heterogeneity within the US in terms of ethnicity, race and even language makes it one of the most heterogeneous populations in the world and adds to the difficulty of disentangling mechanisms.

While studies outside the United States have also found a positive association between inequality and poor health, these studies have some important limitations. For instance, a recent study found that relative deprivation, a related construct to income inequality, was associated with mortality in South Africa for each race group (Salti, 2010). Again, this setting's recent history of Apartheid makes it an exceptional example. Although the authors examine associations separately by race, there could be spillover effects from one race to another, as was found in the United States (Deaton and Lubotsky, 2003). Still other studies have found relations between inequality and health in less heterogeneous settings (e.g., Western Europe (Hildebrand and Van Kerm, 2009) and Latin America (Subramanian et al., 2003)), but examined self-reported health, which may be more susceptible to bias (Deaton, 2003). Thus, there is a need for research on inequality and objective health measures in racially homogeneous settings in order to distinguish between the theories called upon to explain the inequality and health relation.

Further, examining a range of health outcomes in relation to inequality may help elucidate more proximate mechanisms. For example, certain causes of death are directly related to behavior and lifestyle choices. If we see increases in these causes of death in areas with increasing inequality, we expect that the relation may be mediated through changes in health behaviors. If health behaviors are implicated in the pathway, then future research could focus on appropriate policy interventions. Unfortunately, most careful longitudinal analyses have focused on all-cause mortality and/or self-reported health. To the extent that cause-specific mortality can illuminate patterns, it should be examined alongside these other outcomes.

It is also important for research on inequality and health outcomes to consider the relation over plausible time intervals. While relations of inequality with health behaviors might be expected over a relatively short time interval, relations with mortality would only be plausible with a time lag of many years. Consequently, careful attention should be paid to the use of appropriate time lags for the inequality exposure given that

mortality is often the outcome under study (Glymour, 2008). Most studies have examined contemporaneous inequality and health outcomes (most often self-reported health) and thus have not examined the relation in a way that is consistent with plausible timing of effect. The few studies that considered lags suggest the strongest relation between income inequality and all-cause mortality occurs at lags of 10–15 years (Blakely et al., 2002; Milyo and Mellor, 2003; Subramanian and Kawachi, 2004).

Attempting to address some of the issues outlined above, we examined the longitudinal relation between income inequality and mortality from different causes in Costa Rica. To remedy the first problem, we selected Costa Rica because the theories presented above are more likely to be distinguishable due to several institutional characteristics. First, Costa Rica has a highly homogeneous population. Using the sum of the ethnic, linguistic, and religious fractionalization measures created by Alesina et al. (2003), Costa Rica ranks in the bottom decile in the world in terms of combined ethnic, linguistic and religious heterogeneity. As a frame of reference, South Africa ranks in the 90th percentile, the US ranks about the 70th percentile, China ranks in the 30th percentile, and Costa Rica ranks in the 10th percentile. Clearly, ethnic differences are less likely to confound compared to other well-studied cases. Second, Costa Rica has a highly centralized political system which allocates health service, education, and most local resources (Mesa-Lago, 2000), making the possibility of systematic local underinvestment in unequal areas unlikely. In addition, Costa Rica has a nationally run universal health insurance regime with an independent budget, making political cycles less significant in the delivery of health services. Thus, in Costa Rica any association between inequality and health would most plausibly reflect the psychosocial pathway, as opposed to the neomaterial or resource allocation pathway. Finally, Costa Rica has had increasing income inequality at both the national and local levels in the past 20 years, making it possible to examine changes over a relatively recent period. In addition, these changes are not due to increasing poverty but rather due to increases in income at the higher end of the income distribution. These patterns are presented below in Fig. 1.²

To clarify the issue of proximate mechanisms, we examined all-cause mortality in conjunction with cause-specific mortality for 14 causes and consider age carefully. If a stronger association is found between inequality and mortality from causes related to lifestyle or psychological conditions, we infer that behavior was a key mediator. We also considered two age groups separately because inequality may affect working age populations differently than the elderly through labor market conditions.

To advance the third issue regarding the timing, we considered both changes in contemporaneous and 10 year lagged inequality.

2. Methods

2.1. Data

The data for these analyses combine three data sources obtained from the Central American Population Center (CCP), a research center at the University of Costa Rica. We construct a synthetic panel data set from microdata from the Costa Rican Household Survey for Multiple Purposes (CRHS), the Vital Statistics Registry of Costa Rica, and intercensal population estimates. The outcome of interest, number of deaths, was extracted from the Vital Statistics Registry of Costa Rica. The data include

² Regressions not presented here show that areas with increasing mean incomes also have increasing Gini coefficients after accounting for canton fixed-effects.

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